THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXXVIII. No. 2171.] LONDON, DECEMBER 20, 1904. [56TH YEAR. PRICE 6d.

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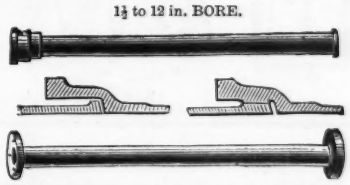

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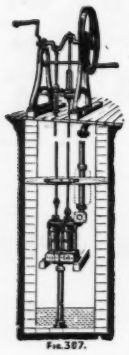

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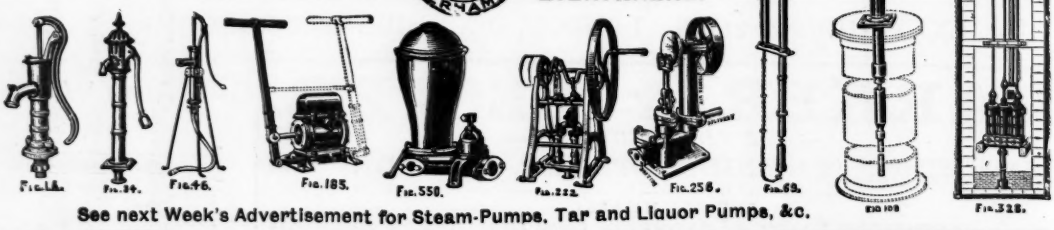

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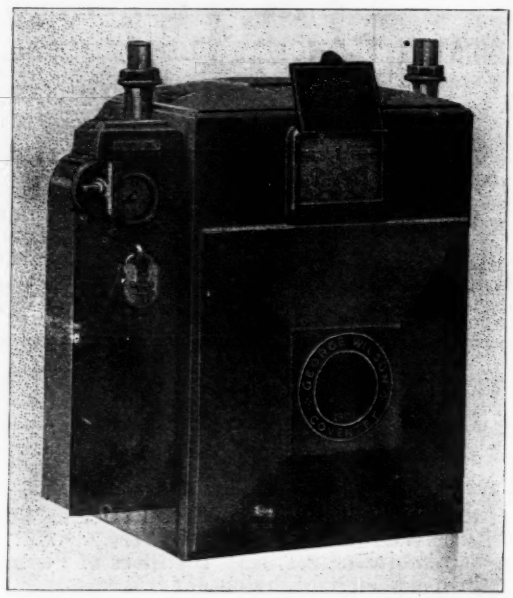

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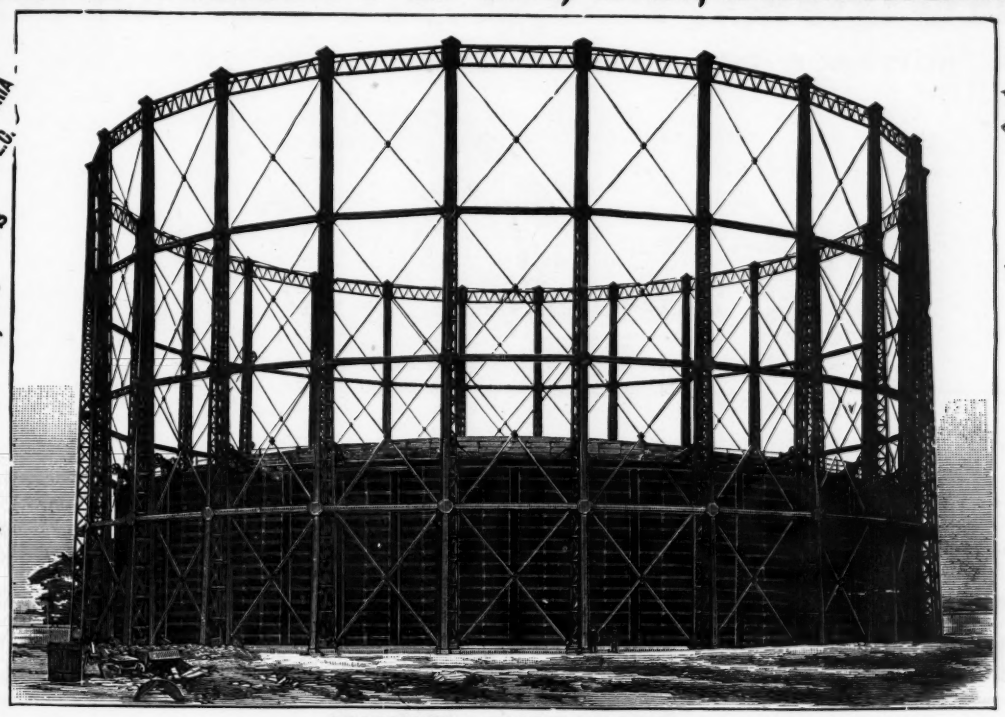

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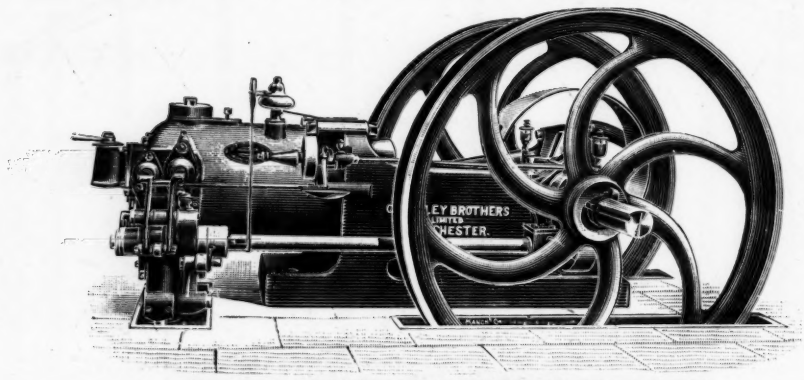

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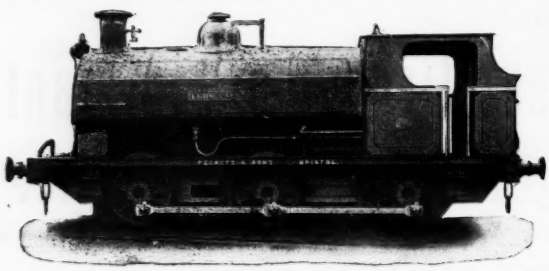

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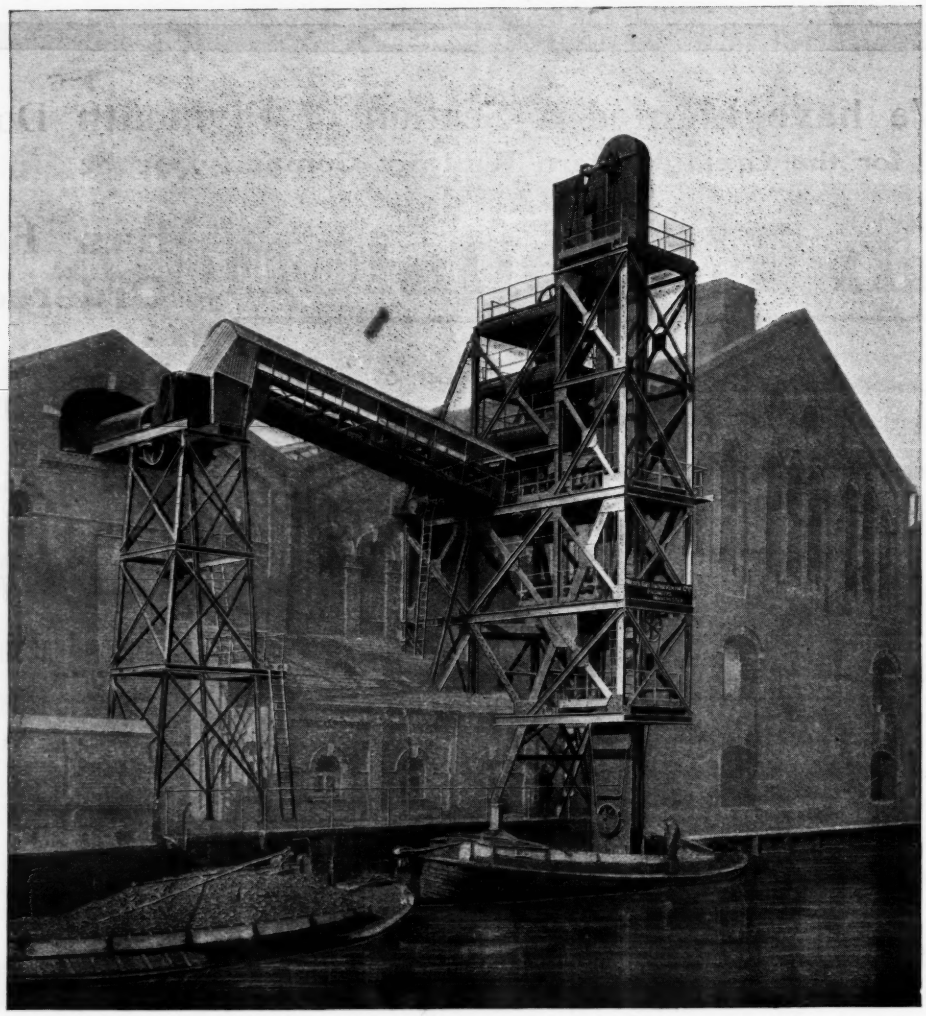

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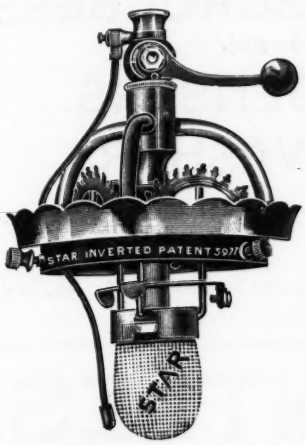

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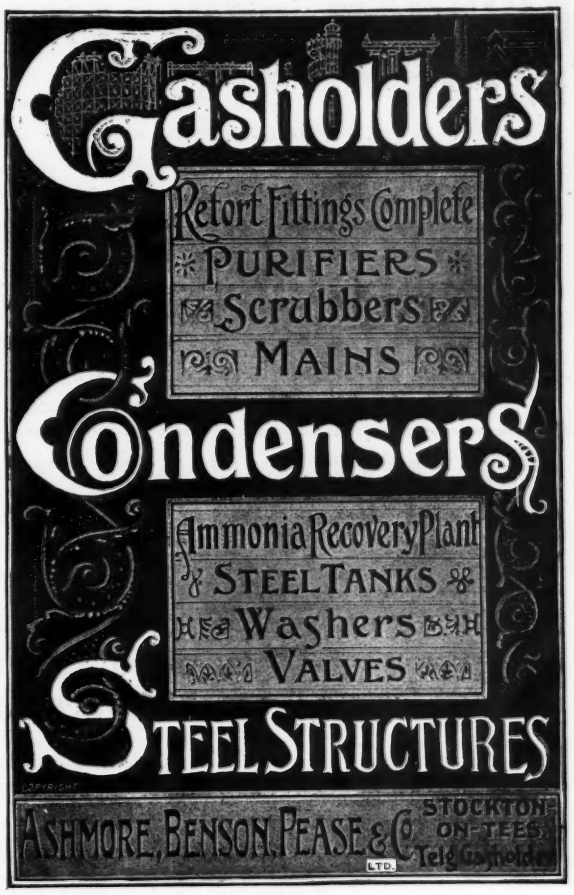

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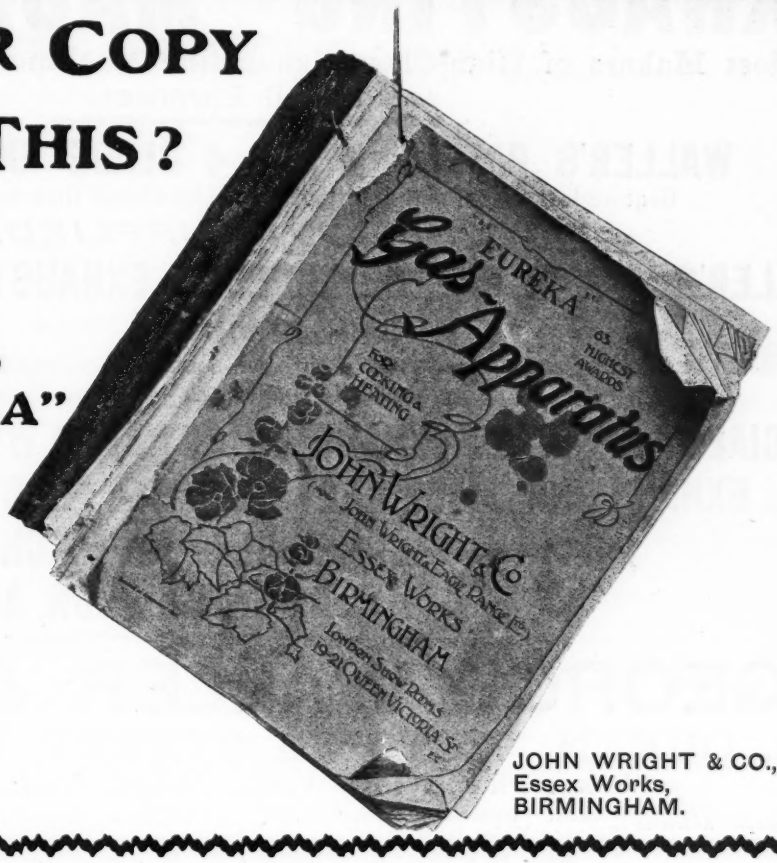

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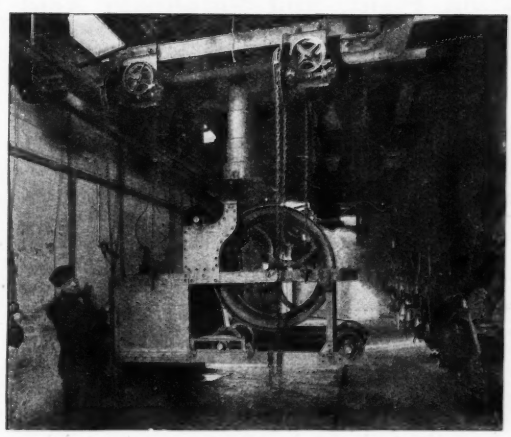

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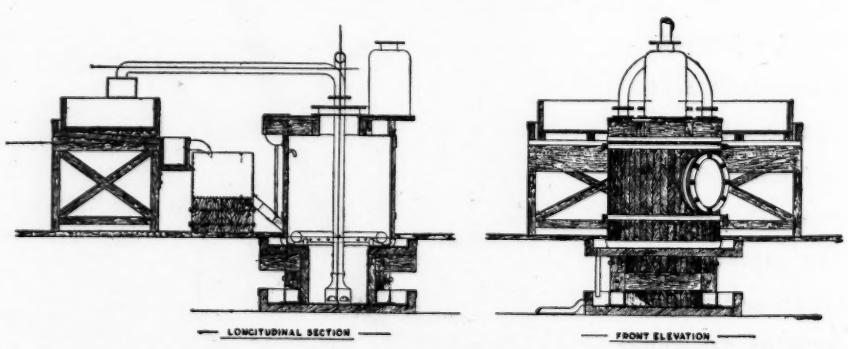

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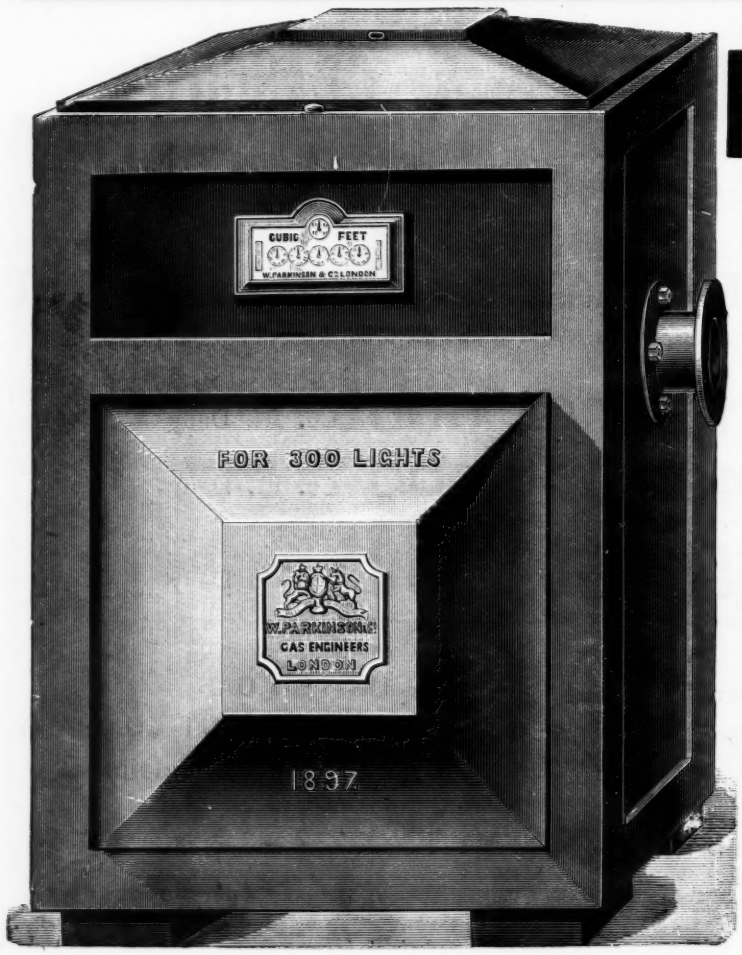

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EDITORIAL NOTES—GAS, &c.

The Gas Exhibition and its Lessons.

A THOROUGHLY successful show was brought to a close last Saturday. It was rightly described as one of the sights of London; and it is very pleasing to be able to record that throughout its continuance there was no sign whatever of any waning interest in it on the part of the public. In fact, the attendance during last week was in excess of that of any previous week; overcrowding, as an almost necessary consequence, being again noticeable. It is evident from this, as also from the number of belated applications for space which were received, that more room is required for an exhibition of this kind than was available on this occasion. Nor have the Earl's Court buildings proved to be altogether ideal ones for a gas exhibition. Ventilation —especially during the latter part of the time, when the arctic-like severity of the weather had given place to an unseasonable mildness—left something to be desired, though certainly not the headache for which Mr. Helps was said to have been waiting in vain, but which some others less robust found it not difficult to acquire.

The exhibition of 1882 contained some exhibits which have since proved to be forerunners of the present incandescent system, though they were by no means recognized or even suspected, at the time, of having in them the germs of anything practical or useful. The exhibition which is now closed contained but little that can claim to be innovations upon established practice, either as regards the manufacture or the uses of gas. It will be chiefly held in remembrance as a record of substantial and notable achievement, in which respect it must always stand out conspicuously among the landmarks of industrial progress. There cannot be many industries of which the same is to be said as of the gas industry with regard to the last quarter-of-a-century of its history. Threatened with extinction, or relegation to uses which but a few years ago were considered to be of a wholly subsidiary and unimportant character—regarded, in fact, as moribund—gas has not only succeeded in accommodating itself to these uses to an extent which was quite unforeseen, but has at the same time, thanks to a series of scientific discoveries not less brilliant than fortunate, reasserted itself with marked superiority as an illuminant. Ousted to a great extent from employment in the latter capacity, both for public and domestic lighting, by a powerful and influentially supported rival, it returns to the charge, reinforced to such an extent as to be on more than equal terms with that rival, which, in its turn, sees before it the prospect of being driven from the field.

It is a good thing for any industry that it should be periodically passed in review, so that the losses and gains, and variations in the channels of trade, may be ascertained. This exhibition has afforded an excellent opportunity for taking stock of the gas industry. What, it may be asked, have been the gains, and what the losses, as compared with twenty-two years ago? If measured simply by the rate of consumption, the progress made during that time cannot but be regarded as satisfactory. But this is hardly informing enough. Regard must be had to the sources of consumption which in some directions—and perhaps in the most remunerative—may show a falling off; while in others a sense of security may be engendered which, from a financial point of view, is not justified. An account should be kept of the consumption from every different source, so that the actual value of each can be ascertained. It is well known that in 1882 but little gas was employed for heating, for cooking, or for motive power. There were then only a few gas engines or cookers in use; while, except in certain manufacturing centres, gas was used sparingly for heating purposes. How great has been the change in this respect the exhibition has made manifest to all the world, not only by the great number of appliances it contained for the use of gas for purposes other than lighting, but also by the almost infinite variety of these appliances, the supply of which now constitutes industries of the highest importance, and all of which, it may be safely said, have derived their impetus from, and been developed by, the cheapness and convenience of gas. That the gas industry has benefited thereby clearly goes without saying.

Reference was made in previous articles to the extent to which gas consumption has already been augmented by the developments referred to; but some more information on the subject is much to be desired. Gas-engine consumption is readily ascertainable, because separate meters for gas-engines have usually to be provided; but it is otherwise with cooking and heating appliances, although it should not be difficult to make fairly reliable estimates occasionally of the quantity of gas consumed by the latter. Enough, however, is already known to make it certain that a very large proportion of the increase in gas consumption during recent years is attributable to the extended use of gas-engines and heating appliances of all kinds. Gas consumption has, in fact, greatly changed in its character since the time when the industry mainly depended upon the demand for lighting purposes, which for some years has remained nearly stationary. In this direction, however, a revival may be anticipated with some confidence; but this can only be brought about by persistent effort on the part of gas manufacturers to keep under the notice of the public the advantages of incandescent lighting. An excellent beginning has been made by the exhibition; but it requires to be followed up by local displays. Gas for lighting purposes is already cheap enough; it is not now cheapness so much as notoriety that is required to win back the favour of the public from the electric light. Nor should the forces arrayed against gas be underestimated. Free wiring by local authorities, and the indifference of builders, as much as a belief on the part of the public that it is the right thing to have the electric light, all have to be overcome by energetic canvassing and diplomacy. For heating and motive power, gas stands on a somewhat different footing, inasmuch as it comes into competition with other fuels, both solid and gaseous, and can only be expected to hold its own for these purposes by reason of its superior convenience or economy. This, however, should serve, as it doubtless has served, as a stimulus to exertion; it being generally recognized that, in these days of competition on every side, it is quite as important to extend the business as to bring down costs. With this object in view, every means should be employed to keep well in touch with the consumers, so as to be in a position to ascertain and almost anticipate their reasonable requirements. At the same time, it will not do to relax in the slightest the effort to cheapen the cost of gas, since cheap gas is the very foundation of this part of the business, and upon it depends the great extension of the latter which the future is believed to have in store.

Fortunately, the incandescent system has brought with it aid in this direction, in the shape of relief from the necessity for enrichment, and the maintenance, by whatever means, of a high standard of illuminating power. What is now wanted is not illuminating power for its own sake, but calorific value; and to bring down the former without proportionately reducing the latter is the object to strive for. This can hardly be effected by employing a mixture of coal gas and carburetted water gas, owing to the deficiency of the latter in calorific value. The adoption, moreover, of a dual system of gas making almost inevitably distracts attention from the one or the other branch of it; and it is the coal-gas branch which is likely to suffer most from this, since its manufacturing processes are progressive, whereas the manufacture of carburetted water gas seems to afford but little scope for further improvement. The plant for the production of this gas was not in evidence at the exhibition, which, however, well exemplified the great progress made in connection with coal-gas manufacture since 1882. At that time, for example, the regenerative gas-furnace in its present form had only just been introduced into this country, nor was it until some years later that the prejudice against it was entirely overcome. Since then, it has won favour as

a means for effecting a great improvement in carbonizing results; and no gas-works without it can lay claim to be called modern. To what extent it would be right to credit it with the substantial average increase of yield of gas per ton of coal carbonized which has taken place during recent years, it is not possible to say; but certainly it is entitled to a considerable share of that credit.

Labour-saving appliances mark a very great advance; and in some respects—notably in regard to coke conveyors—have developed to a degree of excellence and reliability not thought possible twenty-two years ago. This development has been almost entirely the work of the last ten or fifteen years; for prior to about the year 1890, hot-coke conveying existed only as an idea. Several attempts were made shortly after that time; but it was not until the advent of the De Brouwer hot-coke conveyor a few years afterwards that the practicability of applying machinery for this purpose was generally conceded. Since then, the progress in this direction has been rapid, if not altogether uninterrupted; and the man with the coke-barrow is in most large gas-works threatened with the same fate as the flat-flame burner. There are, it is true, some who still believe in hand labour for the retort-house, and for whom even the newest forms of stoking machinery have no real attraction. These, however, are the exceptions to the inevitable tendency to substitute machinery for hand labour for all operations involving the handling of quantities of material.

While it is true, as already stated, that the exhibition contained but little which can claim to be innovations upon established practice, that little is far from being unimportant. For instance, very many will have become acquainted for the first time with the ingenious rotary meter invented by Mr. Marsh, which, being of small compass, seems to be admirably adapted for use as a secondary meter, for ascertaining consumption for cooking or heating, or for measuring very large volumes of gas. The Settle-Padfield vertical retort, which is still in the experimental stage, has the best wishes of everyone for its success—it being a laudable attempt to solve the labour difficulty, and at the same time furnish a system for the economical production of large yields of low-grade gas. Mention should also be made, as a means for reducing the cost of large-sized trunk mains, of the lock-bar system of jointing exhibited by Messrs. Stewarts and Lloyds, by which mild steel mains of large diameter, and up to 45 feet in length, are made at a cost much below that of cast-iron mains of equal calibre.

We cannot conclude these articles without again expressing great satisfaction at the unqualified success of this memorable exhibition. It has reflected infinite credit upon all concerned, whether promoters, exhibitors, or organizers, and cannot but redound to the solid advantage of every branch of the great gas industry.

Close of the Exhibition and Future Displays.

On Saturday night at Earl's Court, the gas-lights were finally extinguished, the gas-fires and cookers became cool, the gas-engines ceased their throbbing, and the moving machinery was again brought to a state of inaction; and this was the end, in its collective and demonstrative form, of the grand gas exhibition, to which many other qualitative adjectives have been applied, all highly complimentary, but none—that were not possible—excessive. The end of the exhibition! The words are written with mixed feelings of gratification, congratulation, and regret—gratification and congratulation on account of the solid success in every direction and particular, and regret that the brilliant rendezvous of gas men from all parts of the British Isles has so quickly run its course. For the exhibition has clearly had its personal charms and interests in no small degree, as well as its ultimate purposes. But though the end of the exhibition has come, the end of its influence can never be marked while gas continues in the service of mankind.

What were the objects of the exhibition? They were manifold. But primarily and generally they may be summed up in the single statement, to promote the interests of the gas industry; while this may be divided into—first, the provision of a vast educational illustration of the many uses of gas; secondly, the demonstration of superiority in comparison with competitors; and, thirdly, the showing—not only to the public but to gas purveyors—of the best in all the different classes of goods that the manufacturers can offer. In those purposes, has the exhibition succeeded? Unhesitatingly and emphatically the reply is given in the affirmative. For not only were all the essentials to success on the one part present in the display, but the necessary interest to constitute success on the other part, and make a perfect whole, was furnished by the admiring multitude. The exhibitors are pleased, all who took part in the organization and management are, if anything, even more so, and the gas industry generally is gratified. What has been done at Earl's Court has shown the whole country that gas occupies an eminence from which it will not be easy to dislodge it, though the road to gain it since the exhibition of the early eighties has been, or was in the first part, a difficult one to climb. We hope, too, in the words that Mr. J. W. Helps, the Chairman of the Advisory Committee, used at the valedictory meeting on Saturday, that the exhibition has had the coincident, though previously unconsidered, effect, of creating "a better feeling between manufacturers and gas companies, "committees, and engineers."

The farewell assembly at Earl's Court, just before ten o'clock on Saturday night, was a simple but hearty affair. Well-merited thanks and praise were freely dispensed in the short speeches that were made. The lion's share deservedly fell to Mr. Helps; honour being in this case conferred where honour was richly due. He has been the mainspring, the life and soul, of the whole of the work and management; and Mr. Bridges, speaking on behalf of himself and his colleague in the organization (Mr. G. D. Smith), acknowledged this in manner so candid that it amounted to a confession that he considered, without the Chairman of the Advisory Committee, the Organizing Managers could never have accomplished so thoroughly their own large share of the work. The President of the Institution of Gas Engineers (Mr. D. Irving) also took part in the closing scene. It is only fit and proper that we should say here, that personal inconvenience has with him all through been a secondary consideration in fulfilling his duties as, at this important time, the official head of the gas profession's organization. No man occupying that honourable post could have done more than Mr. Irving has in the conscientious discharge of the obligations attaching to it. All functions during the exhibition have seen him in his rightful position; and behind the claims of public appearance, he has been at the beck and call, and has voluntarily interested himself in the doings, of the Advisory Committee. His reception on Saturday night by the exhibitors was marked by the sincerest cordiality. One point more in this connection. In the distribution of praise, it was almost startling to learn, and from Mr. Clare, the Chairman of the Exhibitors' Committee, that the Gas Press has done anything to merit public recognition, either before or since the opening of the exhibition, in the way of cultivating interest throughout the country in Earl's Court; but although the recognition was made at the twelfth hour, we, for our own part, appreciate it none the less.

Now as to the future. There has been some talk of holding sectional gas exhibitions elsewhere. It will be several years yet before, from the point of view of the exhibitors at Earl's Court, the harvest, both for the gas industry and themselves, from the extraordinary display there can possibly be exhausted; and they are of opinion that it would be a pity to dim the lustre of this exhibition by holding others on a small and relatively insignificant scale, for some time to come, in other parts of the country. Moreover, this exhibition has involved them in such heavy expenses, that they do not care to commit themselves yet awhile in similar manner. These, we understand, are among the considerations that induced a large representative meeting of the exhibitors on Saturday to instruct their Chairman (Mr. Clare) to communicate to Mr. H. Kendrick, the Secretary of the Manchester District Institution of Gas Engineers, a resolution expressing, with regret, the inability of the manufacturers at Earl's Court to participate in an exhibition in Manchester next year. It was only to be expected that the magnificent success of the past month's exhibition should stimulate a desire in various parts of the kingdom to organize demonstrations of gas lighting and heating within easy reach of the consumers of gas undertakings far removed from London. Five (even ten) years are spoken of as being reasonable time-limits within which the Earl's Court exhibitors would prefer to be relieved of further expenditure, both of money and time, in this direction; and they fear that, if anything is done in the near future, it will

only be in a half-hearted way. Seeing that so many of the leading manufacturers have been exhibiting at Earl's Court, and the resolution of Saturday is their expression of opinion, it seems—unless, of course, attractive terms can induce them to change their views—that the prospects of having an early exhibition elsewhere are not favourable.

The Projected Institution of Gas-Works Contractors and Manufacturers.

THE meeting called by Mr. Charles Clare, as Chairman of the Earl's Court Gas Exhibitors' Committee, to consider the question of the formation of an Institution of Gas-Works Contractors and Manufacturers, was attended by upwards of a hundred gentlemen, representing the commercial branches of the gas industry. We learn that generally the idea, as initiated and outlined in the last two issues of the "JOURNAL," was very favourably received, and that it was the judgment of several speakers that useful service in the gas industry could be achieved by such an organization. As stated in a previous article, the hope was expressed, by a prominent speaker at the farewell meeting at the close of the exhibition on Saturday night, that one of the results of the exhibition will be the begetting of a better feeling between manufacturers and gas companies and committees and engineers. The realization of this aspiration cannot, it is believed, be better achieved than through a manufacturers' organization, with elevated aims, and working in co-operation at all possible points with the Institution of Gas Engineers. What we hoped would result from the exhibitors' meeting is found in the resolution passed. They have taken upon themselves the responsibility of calling, through Mr. Clare, a general meeting of gas-works contractors and manufacturers to further discuss the question prior to taking any definite action. At this second meeting, if the project then receives the support of a representative majority, a Committee can be appointed to consider and report upon the preliminaries, arrange for the framing of the rules, the constitution of the Council, and the classification of the membership. If such an Institution is formed, we hope that—while principals, directors, managers, and qualified engineers are placed in the category of members, and that honorary membership will be established for distinguished services in invention and construction—provision will be made for the admission as associates of all *bonâ fide* in the service of those qualified for full membership. Their incorporation and recognition in this manner would be an incentive to good work with the view of attaining a higher position in the organization, would have other salutary effect, and would promote that *esprit de corps* which in business as well as in other walks in life is an inestimable advantage. We hear it is not intended to call the general meeting referred to until well towards the end of January, so as to escape the Christmas Holidays and the busy times accompanying the entry into a new year's work.

The Troubles of a Continental Gas Company—The Milan Inclined Retorts.

THE affairs of the Continental Union Gas Company, Limited, occupy a large amount of space in our "Miscellaneous News" columns this week, through the extended proceedings at the meeting of the proprietors last Tuesday. To those only accustomed to the comfortable present-day progress of British gas companies, the story unfolded to the proprietors of this Company will read something like fiction. But those who administer the concern, and those who have their money invested in it, are only too well aware of the reality of the statement. A ruthless combination of adverse circumstances, amounting to a crisis in existence and fortune, has been besetting the Company at every point; and while we believe that the worst has now been seen, it cannot be said, as a matter of fact, that the road before the Company is even now clear of all influence malign to prosperity. It is a common thing to hear Directors say that the period upon which they are reporting has been one of great anxiety for them; but, as a rule, it is not to be compared to the anxiety, vexation, pressure, and disappointment experienced, during recent times, by the present Board of the Continental Union Company. But the evils from which they have been and are suffering, it should be said, are concentrated almost entirely at the larger stations in Italy. The shareholders are discontented, and naturally so; but that discontent is mingled with sympathy for, and the utmost trust in, the Board.

As readers who are interested in gas affairs abroad are well aware, the Continental Union Gas Company, while they have certain small works of their own, hold the major part of the capital of the Union des Gaz; and the Directors are also members of the Board of the latter. Therefore, for the purposes of this notice of their affairs, the two Companies may be regarded as one. It is in connection with the works of the Union des Gaz that the whole of the trouble has, over a series of years, existed, and in part exists to-day. From the shareholders' point of view, the effects of adversity are mirrored in the gradual decline of the dividends; and it is impossible to assert that the bottom in this respect has now been reached. To say the least, the outlook is portentous. Five years ago, the dividend on the ordinary stock was 9 per cent.; in 1902, 8 per cent.; in 1903, 7 per cent.; and on Tuesday last, the Directors felt themselves obliged to recommend only 6½ per cent. But, paradoxical as it may seem, the fall of profits has been upon a steadily increasing business. In the case of the Continental Union Company, they had an increase of 2½ per cent. in business last year; and in that of the Union des Gaz, of 5½ per cent. The explanation of this contradictory condition of things so far as the past is concerned, has been given; so far as the present is concerned, partially so. The troubles are both of internal and external origin. From the strike of the men at the Italian works in 1901 to the present, the question of labour has been as a millstone round the necks of the Directors and their officials. Everything conceivable has been done to conciliate the men; and through compulsion of circumstances, the Directors have yielded to them in a manner that would not be tolerated in this country. And the while, the Italian authorities—particularly in Milan—have occupied an attitude of supineness that has ended, in that city in the present year, in nothing short of temporary anarchy and public disaster. But the recent elections, it is hoped and believed, have had the effect of strengthening the hands of local government, and given a salutary check to disorder; so that a more peaceful condition of things may now be looked for. While this is so, the Company are still struggling with the uneconomical condition imposed by the Italian gas worker, of giving an unfair day's work for a fair day's pay.

Labour, however, is not the only trouble. The market for coke is a serious factor in the Company's prosperity. Upon the profits from their main residual, the Company largely depend; but last year they experienced, owing to mild weather and partly to competition from France and Germany, the remarkable fall in price of 2 frs. per ton. It is true there has since been an improvement in Milan; but how long this will be maintained is questionable, seeing that, with increasing output of coke all over the Continent, there is little chance of the competition abating. In all probability, it will become more severe, unless new outlets are discovered, which will assist coke in commanding better prices. The complex situation is made even more embarrassing by outside causes. Private enterprise in gas supply is thwarted in Italy in all ways by the infliction of rigorous conditions. In Milan the price of gas is even now something under 4s. per 1000 cubic feet, and this with imported coal costing—one proprietor stated at the meeting—nearly twice as much as gas coal in London; and that coal carries a tax which cost the Union des Gaz last year £13,589, or equal to 1·36 per cent. on the capital. The reduction, too, in the value of coke, and the increase in the salaries, wages, and pensions paid, together represent the enormous difference of £24,800, which is equivalent to 2½ per cent. on the capital of the Company. A large part of this has been the *douceur* to internal disaffection.

That is part of the story, but it is not the whole; and, with all deference, we submit that it would have been better if the Directors had taken the proprietors into their full confidence over the circumstances alleged in connection with the new plant at Milan; and also as to whether their hopes regarding the profitable employment of the whole of the new works at Nanterre is in a fair way of being fulfilled. With regard to Milan, it was simply mentioned by the Chairman that the Company are in dispute with the contractors for the new benches of inclined retorts; and what may be a disagreeable task was relegated to the future by the aid

of the statement that, as litigation is pending, reference to the matter was precluded. A plain statement could surely have been made to the proprietors to show them what was involved in the dispute, without prejudicing the action or the Board in any way. If the accounts of the Company for the past five years are referred to, it will be seen that the total amount debited for capital by the Union des Gaz has been little short of £600,000. The necessities of increased business account for part of this; and part, too, has been spent in trying to secure economy, and in obtaining a little relief from the tyranny of labour. No blame can attach to the Directors for this, but rather all possible commendation. It is their ill-fortune that, having paid the price of economy, economy has not been realized at Milan, through the pernicious rule of labour—the stokers absolutely refusing to carbonize more than 2 to 3 tons of coal per day, as compared with 9 tons at the French works of the Company with the very same type of plant. But the large expenditure on the new inclined retort benches at Milan has been partially—as to how much is involved rumour tells a varied tale—lost by the pulling out and the reconstructing to a considerable extent of the benches. Whether this laying to waste and rebuilding is justified or not, and who is to lose the money involved, are the points that the Courts are to be called upon to decide. This much and perhaps a little more the Directors could well have told the proprietors on Tuesday last without in any way jeopardizing their position. However, the sooner the dispute is settled, the better will it be, if only to set at rest the busy tongues that have carried the tale, with several variations, throughout the country.

Gas Companies and Trustees in Bankruptcy.

By the courtesy of the Gas Companies' Protection Association, we are able to publish the opinion of Mr. J. Shiress Will, K.C., upon the position of trustees in bankruptcy in regard to obtaining a supply of gas without being required to pay arrears due from the bankrupt. The point is one of considerable importance to the administrators of gas undertakings, whose thanks are due to the Association for the steps they have taken to obtain the views of so eminent a legal authority; and we have no doubt that the questions put to Mr. Shiress Will, and his replies, will receive the consideration they deserve. It will be seen that a trustee in bankruptcy is held to be an incoming tenant, and not a continuing tenant or caretaker; the distinction between such a trustee and a receiver being that a receiving order does not divest the debtor of his property (which remains his until adjudication in bankruptcy), while the appointment of a trustee vests the property of the bankrupt in the trustee. Though, therefore, in cases where there is no adjudication in bankruptcy, but only a receiving order made, the gas may be cut off for the non-payment of arrears, Mr. Shiress Will, for the reason stated, is of opinion that a trustee in bankruptcy who carries on the bankrupt's business on the premises theretofore occupied by the bankrupt is entitled to a supply of gas to such premises in a case where the bankrupt, at the time of his adjudication, was indebted to the gas company for gas supplied to such premises, without being required to pay the gas-rents in arrear. He is further of opinion that the trustee, before using the gas, ought to serve notice on the Company of the requirement of a supply; and that it is the right of the Company to demand security for payment in respect of gas to be supplied by them. The question of penalties in case of notice not being given by the trustee is also dealt with by Mr. Shiress Will; and in conclusion he points out that there are Gas Companies whose Special Acts give them power to distrain, after the commencement of bankruptcy proceedings, for gas supplied prior thereto.

Monazite Sand and Thorium.

It appears that the question of monazite sand and thorium has again reached an interesting stage; but the information to hand is of a somewhat contradictory and confusing character. In the first place, one correspondent sends us a translation of a paragraph published in a Continental gas paper. It reads as follows: "Thorium has this year risen to 53 marks per kilo. The contract between Gordon and De Freitos for the exploitation of the monazite sand in Brazil, thus enabling them to declare the price, expires on the 1st of January, 1905. According to the 'Breslau General Advertiser,' it looked as if the contract would not be renewed, in which case there would be keen competition between the two parties, and thorium would have become cheaper. But according to the latest developments of the negotiations, it is expected that the interested parties will prolong the contract, and thorium manufacturers anticipate a rise in the thorium price to 60 marks per kilo., to take place as from Jan. 1. Notwithstanding the higher prices for ether, cotton, collodion, camphor, &c., the mantle prices have still further receded. The Syndicate fixed their minimum prices for the home trade only; but the export trade is pushed at ruinous prices. The German mantle manufacturers alone ship some 70 millions of mantles to England, who is a buyer of all refuse goods—of course, at exceedingly low prices." Now in reference to this statement, it appears to be true that Gordon and De Freitos have really combined, but it is declared that it is equally true that Gordon has commenced an action against the Brazilian Government for having given a De Freitos concession. As to the anticipated rise in the price of thorium to 60 marks a kilo., we do not believe, in view of information from other quarters, that the price of thorium will go higher. Manufacturers appear to be now well stocked. Only lately in the "JOURNAL," we have had an advertisement announcing that thorium nitrate is to be had "at lower than Syndicate prices." Of course, this may simply be due to a surplus stock; but it shows, in that particular direction, there is no anticipation of any immediate shortage or increase in the price of thorium. Moreover, there are plenty of contracts at present prices in hand for almost the whole of 1905. Besides this, the Syndicate must see that it would be very short-sighted policy to further raise the price, as it would simply mean that they would drive the mantle market into the hands of those who are well stocked with lower-priced thorium. Looked at all round, the position, so far as it is possible to gauge it, does not appear to possess any very ominous feature. The price of thorium will not, it is safe to say, be reduced while the present conditions last; but it is equally safe to say that no stone is being left unturned to prevent the control of thorium being confined as at the present time. And the higher the price of thorium, the keener the search for new sources of supply. One point more, the report quoted above states that the German mantle manufacturers alone ship some 70 millions of mantles to England. We do not believe it, and should be inclined to say 25 millions would be nearer the mark.

The Discouragement of Strikes.

In another part of to-day's issue there will be found some notice of the evidence given last week by Sir George Livesey before the Royal Commission on Trade Disputes and Trade Combinations, who have been holding sittings for some time past. Sir George was able to relate, of course, the experience of the South Metropolitan Gas Company in connection with the co-partnership or profit-sharing scheme, which has been so efficacious in securing both the goodwill of the men and the exercise of their best efforts. Besides its other advantages, profit-sharing, at any rate under the plan in vogue with the Company referred to, must render anything at all worthy of the name of a strike practically impossible. But at present the system is not universal, nor even general, whatever may come to be the case in the future. This being so, the question of strikes is still one that must be borne in mind. It is quite true that of late there has been a decided falling off in the number of these disastrous conflicts between Capital and Labour; but it is not easy to decide as to whether this improved condition of affairs is due to a more reasonable attitude on the part of the Trade Union leaders or to the very natural assumption that the present is not by any means an opportune time for hostilities. Perhaps the fact that, where indulged in, strikes do not of late seem to have been so successful as was formerly the case, may have something to do with their waning popularity. But whatever the cause, there is no gaurantee that, with a return of general industrial prosperity, there will not be witnessed a recurrence of the ruinous tactics of the Unions; and in the event of this happening, if "prevention" should not be possible, it will be necessary to adopt the best available means for effecting a "cure." There are plenty of men who are willing—and more than willing—to take the places of the Unionists who may, for the purpose of enforcing a concession of demands upon

their employers, come out on strike; and at the same sitting of the Commission that Sir George Livesey attended, Mr. W. Collison, the Secretary of the National Free Labour Association, gave some interesting evidence with regard to the steps that have been taken by this organization to enable them to do so.

Some Interesting Figures.

As has before been explained in the "JOURNAL," the business of the Association is the supplying of labour wherever there may be a demand for it, and the consequent overthrow of the tyranny of the aggressive Trade Unions; and Mr. Collison related to the Commissioners the work that has been done. More than eleven years ago the first meeting of the Association was held, when it was decided to open free registry offices in London and other parts of the United Kingdom, for the registration and supply of every class of labour in connection with all branches of trade and manufacture. Since then half-a-million men belonging to about 150 different trades have been registered; and no less than 500 pitched battles have been successfully fought with various Unions. From its inception, said Mr. Collison, the Association made it clear that they intended primarily to secure to every man freedom to work on his own terms without interference, to protect those who were threatened, and to prosecute those who threatened; and at the outset, before undertaking any strike, they stipulated that the employers should provide board and lodging in the works for the free labour men (and protection if necessary) on their arrival. A staff of trained emergency men was also organized, for the purpose of undertaking as far as possible to protect from Trade Union pickets men who were willing to work, and had been selected from the Association's register to do so; and in every case this policy was successful. With reference to the question of the advisability of making some alteration in the law relating to picketing, Mr. Collison stated that during the eight years previous to the Taff Vale and other legal pronouncements (from 1893 to 1901) it was estimated that no less a sum than £285,000 was spent by employers in protecting members of his Association from Trade Union pickets while strikes were on. Five members of the Association had been killed and 250 seriously injured during the same period. Since the Taff Vale decision, however, the Association have fought some twenty-five large strikes; and it has only cost a little over £4000 to protect free labour men from the violence of pickets. In the case of several recent disputes, the free labour men have been marched through the streets in a body, right among the crowds of strikers and their sympathizers, without being even hooted. That the Union leaders were answerable for the state of things previously existing is, Mr. Collison thinks, clearly demonstrated by the fact that since the Union funds have been held responsible for the actions of officials and pickets, acts of violence have almost entirely ceased. Under these circumstances, he is strongly convinced that "watching and besetting" should not receive legislative sanction in any shape or form; and that the qualifying clause in the Conspiracy and Protection of Property Act, 1875, which legalizes it if done "merely to obtain or communicate information," should be abolished as being unnecessary and a source of individual injustice and public danger.

High-Pressure Gas v. Electricity for Street Lighting.

If any of the members of the Court of Common Council visited the International Gas Exhibition at Earl's Court, which closed its wonderfully successful career last Saturday, they would have had no hesitation in supporting the remarks made by Mr. A. C. Morton at the meeting on Thursday, which will be found reported in another column. The question before the Court was not a very important one—it being simply whether or not £300 should be spent on three 2000-candle power high-pressure lamps to be put up in places indicated by the Streets Committee. But it was the commendation of the system by Mr. Morton, in his capacity of Chairman of the Committee, that was so noteworthy an incident of the proceedings. Why did the Committee recommend the system? Solely because electric lighting has been tried in the City, and has not been a success. Mr. Morton had no doubt perused the articles on the public lighting of London and some of the chief Continental cities which appeared in the "JOURNAL" early in the present year. At all events, he was able to tell his colleagues on the Council what was being done in Paris and Berlin—viz., that the electric light was being discarded in favour of incandescent gas, for the simple reason that, as had been proved in London, this system of gas lighting, with high pressure, was the "best and cheapest street lighting" at present obtainable. The members of the Council need not go abroad to see what gas can do. If they want ocular proof of its capabilities, let them remain in the City till nightfall, and look at the lighting in front of the Royal Exchange and the Mansion House, of which we endeavoured to convey an idea by the reproductions of photographs given in the last number of the "JOURNAL." We have from time to time heard disparaging comments on the arc electric lighting in the City; but we question whether it has ever been so strongly condemned as it was by Mr. Morton on the occasion referred to.

Bolstering-up Municipal Undertakings.

Members of public bodies are constantly confronted by the problem of which is the right course to pursue when their interests as ratepayers conflict with their desires to make profit as municipal traders. This especially applies to corporations who run electric light works in competition with gas-works owned by a company. There the question is continually arising of whether the cheaper and better light shall be used, even if the gas company benefit a little by it, or the less effective and more expensive light, because of the supposed necessity of encouraging the municipal undertaking. It is a nice point, especially when the municipal electricity works are struggling along in a desperate effort to make ends meet and avoid becoming a charge upon the rates. As a rule, the municipal undertaking scores an easy victory in a contest of this character. It is in the interest of town councillors to put the best face possible upon the conduct of affairs for which they are responsible, and to make the business they are carrying on in the public interests appear to be prospering. Besides, there is the argument, which has naturally some weight, that if the corporation do not support their own works, they cannot expect others to do so. The result is a good deal of indifferent and costly lighting in public streets and other places where incandescent gas might be used with greater effect and at less expense. A case in point arose at the last meeting of the Worcester City Council, when the question of the better lighting of the Market Hall was under consideration. It was admitted on all hands that the existing lighting was bad, and in order to improve it the Markets Committee recommended an increase in the number of electric lamps, and a rearrangement of those existing, at an addition of £20 a year to the cost. As an amendment, it was proposed that the Gas Company should be asked to give an estimate of the cost of lighting the building; the contention being that it was not right to force the electric light on the ratepayers at any cost, even though the Corporation owned the works. A large majority of the Council rejected the amendment. Those who supported it were told the question was not whether the Gas Company could do the work better, but whether the Council intended to do all they could to make their own venture prosperous. As one member bluntly put it, if they could not find electricity to light their own markets, they ought to shut up the electricity works. But neither this gentleman nor any of the other advocates of electric lighting explained why it is better for the ratepayers to be indirectly taxed for the support of the undertaking than it is to pay a rate levied for this purpose.

Local Loans and their Application.

Attention has been called by the Plymouth Water Committee to an example of what they consider the excessive control which the Local Government Board endeavour to keep over the loan expenditure of local authorities. On the presentation of a report by the Water Engineer that £20,000 was required for the extension and renewal of mains and meters, inquiries were made as to the financial position of the Committee. The result was to show that, out of a loan of £20,177 raised in 1902 for new mains and meters, only £10,558 had been expended, but that the balance s not available for present requirements because it can only be spent for the specific purpose for which the loan was granted. When the sanction was applied for, building was proceeding steadily in one direction, and the laying out of a number of new streets was in contemplation. Development in that neighbourhood has, however, been slower than was once anticipated, and

building now proceeds more rapidly in another part of the town. The Committee decided to call the Local Government Board's attention to the objections to a system which necessitated the raising of a fresh loan under these circumstances; and an effort will be made to induce the Board to make their rule with regard to the application of loans to specific purposes a little more elastic. The Water Committee will, no doubt, be able to advance a good case for the relief they seek. So long as the money is really spent in providing new mains, it can make little difference to anyone whether they are laid down in the north or south districts of the area of supply. At the same time, the Local Government Board may probably say that if the Committee did not require the money they need not have contracted the loan, and that it is only the fault of the Corporation if they are paying interest unnecessarily.

The Power-Gas Corporation.

From the report and accounts of the Power-Gas Corporation for the year ending Sept. 30 (which were adopted at the fourth ordinary general meeting held last Wednesday week), it appears that the dividend recommended on the present occasion is at the rate of $3\frac{1}{2}$ per cent. per annum on the ordinary shares, as compared with 5 per cent. (less income-tax) for the previous year, and 6 per cent. (less income-tax) for the twelve months before that. It is stated that, after some unexpected delay due to extraneous causes, the generating and distributing plant for the South Staffordshire Mond Gas Company's first central station is now on the point of completion; while other important installations in various representative industries have been carried out and are successfully at work. The shareholders are reminded that the North-Western Electricity and Power-Gas Company, who in 1903 obtained parliamentary powers for the distribution of electricity and power gas throughout North Staffordshire and parts of the counties of Derby, Flint, and Denbigh, were obliged to apply again for further powers; the necessary Act being passed during the last session. The accounts show a balance to the credit of profit and loss account of £10,144, which it is proposed to apply to the payment of the dividend mentioned and to writing £1000 off the preliminary expenses account. This will leave £2000 to be carried forward. Last year the sum at the credit of profit and loss account was £13,082, which, after the payment of the dividend at the rate of 5 per cent., allowed of £2000 being written off the preliminary expenses account and £1694 being carried forward. The Directors, however, point out that the progress and profits of the Corporation's business during the past twelve months have been adversely affected by the depression in the general engineering trade. The accounts include a sum of £22,875 for contracts partly executed, including an estimate of profit to date approved by the Directors, less cash received on account. In their certificate, the Auditors mention that "the property account of the Company appears in the balance-sheet at cost price without depreciation;" and that "the investments in, and advances to, Subsidiary Companies are taken at cost." The investments and advances referred to amount to £124,250; and the capital issued to £304,115, out of the total of £350,000 authorized.

Mr. G. E. Davis, whose work on "Chemical Engineering" was recently reviewed in the "JOURNAL," proposes (*vide* his patent No. 26,566 of 1902) to produce sodium ferrocyanide from ammoniacal gas and water by the following cycle of operations: Gas liquor is added in slight excess to solution of a ferrous salt, and the precipitate of ferrous sulphide and carbonate, called "sulphide mud," is filter-pressed, and mixed with sodium carbonate solution, five molecules of which are taken for every four molecules of the ferrous salt from which the sulphide mud was derived. The mixture, or "alkali cream," thus formed is used to wash gaseous mixtures (such as crude coal gas) containing hydrocyanic acid (HCN) or ammonium cyanide (NH_4CN) until it ceases to absorb cyanogen compounds. The mixture then contains insoluble ammonium ferrous ferrocyanide and some ferrous sulphide in suspension in a solution of sodium ferrocyanide and carbonate. This product is passed through a heater and still for distillation with soda, whereby the ammonium base is replaced by sodium. The sodium ferrocyanide is obtained from the solution by the usual processes. The filtered-off residue of sodium ferrous ferrocyanide is agitated in the cold with rather less than sufficient caustic soda to remove the basic iron, whereby ferrous oxide and sodium ferrocyanide are formed, and are reserved for treatment in the cycle of operations.

THE LAST DAY OF THE EXHIBITION.

The Public and the Exhibition—Championship Cookery—A Valedictory Meeting—Medals for Exhibitors.

THE turnstiles at Earl's Court began to gyrate early on Saturday morning; and it was quite late in the evening before the last person who had to show a ticket or pay the price of admission in coin passed through into the most brilliant and animated scene then to be found in London, and which—with all its gratifying features to everybody concerned in it in small or large part, and to the thousands upon thousands who have witnessed it—will remain long in memory.

Among the first comers on Saturday were a considerable number of the principals of firms and others representing the exhibitors, in response to the summons of Mr. Charles Clare, the Chairman of the Exhibitors' Committee, to a meeting, primarily to consider the question of whether they should, as a body, take upon themselves the responsibility of the initial steps towards getting discussed, in all its bearings, the scheme for the formation of an Institution of Gas-Works Contractors and Manufacturers. The interest shown in the matter by the numbers present—at times the total exceeded, we should say at a rough guess, 100—is favourable to the prospects of the idea being carried to fulfilment. The meeting was conducted privately; but the resolution passed has been—complying with the behest of the meeting—communicated to us by the Chairman. The gist of the resolution and further remarks on the subject will be found in our leading columns. Several other matters, of a more or less private nature, were also considered; and this shows the value of a representative organization. One of them had reference to future exhibitions; and, as will also be seen in an editorial, the meeting—representing, be it remembered, the large majority of the exhibitors, and consequently the majority of the leading gas manufacturing firms of the country—was almost, if not quite, unanimously against any further exhibition, even of a sectional order, being held for some years to come. Therefore, the prospects of Manchester, Glasgow, Dublin, or any other places that have been mentioned as good for an exhibition, do not for the immediate future look very promising.

Soon after noon, the attendants at the entrance were more busily employed; the public as the evening hours passed continuing to stream in, until the large buildings became densely packed, and passage between the stands had perforce to be made at a snail-like pace. It was a good-humoured crowd, essentially bourgeois, who quietly surveyed the sights and wonders of modern gas performance, without jostling or the slightest suspicion of ill-mannered behaviour. "This is the sort of crowd that is no good to us," remarked more than one exhibitor. "They are not the kind to place orders with us." Mistaken exhibitors in regard to the former postulate! Correct perhaps, in its direct application, in regard to the second point. Thousands upon thousands of these people are consumers of gas to varying extent; and thousands upon thousands of them are prospective consumers. The inspection of the exhibits will have infused among that great multitude a desire for something better, and more, than they have got in the way of gas lighting and heating appliances, and not a few who have never been gas consumers will long to have part in the enjoyment of its cheap brilliance and conveniences. Naturally they will apply to the gas suppliers and tradesmen in their districts to provide them with the necessary appliances. The gas suppliers and tradesmen do not themselves make these goods; and so they, in turn, will go to the manufacturers for them. These big crowds of the public are therefore the sources from which will spring the placing of the big orders which they individually are unable to place. Wherefore then the reason for the complaint? But one of our exhibiting friends hastens to assure us that the exhibitors have been very pleased to see the public, and to show them all that they have of valuable use. True and sensible. The private man may not walk about with fat orders for gas appliances in his pocket; but he is one of the number who helps to create those fat orders that have found their way to the exhibitors during the course of the exhibition, and will do so a long way ahead.

The lectures, the cookery competitions, the café chantant, and the military band, all drew their dense audiences on Saturday evening. Far from there being any falling off of interest, the public were as eager, and as great in numbers, as at any time during the exhibition. Each centre of attraction was constantly filled—at times to overflowing; and attendants had to be placed here and there as occasion required to prevent crushing. The event of Saturday, from the public point of view, was, without doubt, the "final" between the ladies who have carried off the prizes and certificates in the cookery competitions during the run of the exhibition. A boxing competition, a football match, or a favourite music hall artiste, could not have brought into the lecture hall a bigger and more mixed audience than on Saturday evening; and had the hall had twice or thrice the capacity, we have not the slightest doubt it would have been filled. People went away from the doors in numbers, with almost rueful faces, because they could not get in. However, the result of Friday's and Saturday's competition for the championship resulted in

Miss Lovell Wright carrying off the gold watch; and Miss Farrow and Miss Lennard the silver ones. As the well-earned honours were handed to them by the Chairman of the Advisory Committee (Mr. J. W. Helps), each lady was vociferously applauded by the delighted crowd; and each deserved it, for, while judgment was beyond question and absolutely fair, the differences in time and marks were not great. The ladies will be envied among their compeers the distinctions they have gained.

The ordinary competitions of the week may conveniently be mentioned here. The menus were—Breakfast: Tea, porridge, broiled chop, mashed potatoes, and American breakfast cakes. Luncheon: Fried sole, peas, sausage in batter, golden pudding, and Welsh rarebit. The winners were—Breakfast: (1) Miss Farrow, (2) Mrs. Haywood, and (3) Mrs. Smedley. The record time was 11 minutes. Luncheon: (1) Miss Stevenson, (2) Mrs. Smedley, and (3) Mrs. Hayward; the record time being 13 minutes. Certificates as well as prizes have been issued to the winners; and of the two, as previously stated in the "JOURNAL," the former appear to be more coveted than the latter. In the children's competition on Saturday, little Daisy Pomeroy, who is only eleven years old, and of the Wesleyan Girls' School (Pimlico Rooms), came out first, though the time occupied was 16 minutes. Connie Garner was second; this young lady being 14 years old, and of Baroness Burdett-Coutts' School. Her time was 10¼ minutes. The third was Ida Orchard, 13 years of age; and her time was 8¾ minutes. The fourth one was Elsie Buddo, aged 12 years, whose time was 11¼ minutes. The two latter are also of the Baroness Burdett-Coutts' School, which has, through the children there, taken many honours during the exhibition.

With the prizes to the winners, other mementoes of these interesting occasions were presented. Throughout the exhibition, Mrs. Sutcliffe, the superintendent of the cookery demonstrations and lectures, won the esteem and confidence of all through her impartiality, kindliness, and friendliness; and this regard was marked not only by personal recognition, but by the gift of a beautiful gold watch on Saturday night. The ladies who have taken part in the cookery competitions marked their sense of the upright manner in which the Secretary of the Advisory Committee (Mr. Webber) read and recorded the indications of his chronometer during the competitions by presenting him with a silver card-case. Mrs. Springthorpe, who ably conducted the cookery lectures and demonstrations during the week, was presented by Mr. Helps with a basket of flowers; and the graceful compliments which he paid her were cheerfully endorsed by the large audience. With this presentation ended a four weeks' exposition of cookery as made rapid, clean, certain, and tempting by the aid of gas-stoves and good elementary training.

To say more about the last day of the great gas exhibition would only be to repeat former experiences until we come to the last scene of all, just before Earl's Court closed its doors on the public and shut in the magnificent illustration of the potentialities of gas. By half-past nine, the crowd had thinned off; and then, in response to a circular sent out during the week by Mr. Walter T. Dunn, the Secretary of the Institution, the exhibitors trooped in considerable numbers into the Lecture Hall. The circular simply expressed the feeling of the Advisory Committee that they would like to have an opportunity of meeting the exhibitors at the close of the exhibition on Saturday; and the feeling was mutual—all sections of the exhibition being largely represented when Mr. D. Irving, the President of the Institution of Gas Engineers, Mr. Helps, the Chairman of the Advisory Committee, some half-a-dozen members of that body, and Messrs. Bridges and Smith ascended the platform. It was a good wind-up—heartiness, and good fellowship being evident, and congratulations heard, on all sides. While Mr. Helps was undoubtedly the "hero" of the occasion, the reception that Mr. Irving got was hardly less distinguished. If we may be allowed to tell the truth without the expression affecting the dignity of the office of President of the Institution of Gas Engineers, Mr. Irving has been voted throughout the exhibition as a "right, good sort of fellow." Therefore on Saturday night his reception by the exhibitors was of the warmest. We need not report the speeches fully—in fact, it would be next to impossible, as the tramping visitors outside the hall and the confusing hum of conversation prevented some of the expressions of even the strongest lunged of the inside speakers reaching all seated below the platform.

However, Mr. Irving, in virtue of his position as President of the Institution, was the first to address the exhibitors. He commenced by remarking that after a month's hard labour and very pleasant "assosiation" ["assosiation" is, we think, the President's one and only peculiarity], the Advisory Committee could not allow the exhibition to close without calling the exhibitors together, and making some statement of their very warm appreciation. On behalf of the Institution, he wished to express their heartfelt appreciation of the energy and generosity of the exhibitors. It would have been quite impossible for any exhibition, however well organized, to have had such great success without the hearty co-operation of the manufacturers. The Council of the Institution and the Advisory Committee therefore desired to congratulate one and all, and to express their very sincere thanks for the able co-operation of the exhibitors in organizing this magnificent display.

Then Mr. Helps was on his feet; and a round of cheering greeted him, accentuating in unity what each voice would have individually exclaimed under other circumstances of meeting—that is, "Well done!" He remarked that, as the President of the Institution had said, it would have been an ungraceful act if the exhibition had been closed by simply allowing the exhibitors to walk out of Earl's Court without asking them to meet the Committee to learn how very heartily they appreciated their grand co-operation. Adopting again an expression that he made use of on the opening night, Mr. Helps said the great reason for the success that had attended this exhibition was the unity of the trinity which had had the active management of the exhibition from the beginning until its conclusion that night. First, they had in that trinity the Institution and the Advisory Committee; secondly, the exhibitors; thirdly, the Organizing Managers. The result of the work of that trinity, those who had been in the exhibition during the past month were just as well qualified to judge as he was himself. He had been asked several times that day whether they were not glad the exhibition was over. He had found it somewhat difficult to answer that question. It was true that at times the interest he had taken in the exhibition had been a little bit of a strain with the other work he was expected to do. But hard work, when other worries did not intervene, never hurt anybody; and the hard work connected with the exhibition had not been accompanied by any worries whatever. From the beginning, everything had gone so smoothly; and to see the smiling faces of the exhibitors had been to him a charm, and that had fitted him more than anything for any work he may have been able to do, either in connection with the Committee or the exhibition. Speaking from the point of view of the Committee, he could hardly have considered, from past experience of exhibitions, and what he had heard of other exhibitions, that matters could possibly have worked so smoothly as during the course of the transactions connected with this show. Everybody had found that it had not been real work, but rather real pleasure. Then Mr. Helps made an interesting announcement. The Advisory Committee, he stated, some time ago decided to have a special silver medal struck. It would have on the one side the initials of the Institution of Gas Engineers "I.G.E.," which coincided with those of International Gas Exhibition. (Applause.) On the reverse side would be the words "A Souvenir of Successful Co-operation." The Committee proposed to ask every firm exhibiting at the exhibition to accept from them one of these medals. The medals, he also explained, were not intended as an award or diploma; but they would serve to remind the exhibiting firms of one of the greatest instances of success in hearty co-operation that had ever been known in this or any other country. In conclusion, he again tendered the Committee's hearty thanks for the kindly way in which the exhibitors had co-operated with them, and expressed the hope that the exhibition would result not only in a better feeling between manufacturers and gas companies, committees, and engineers, but also in adding considerably to the profits of all the manufacturing firms present, and of the gentlemen who were representing them. These remarks were applauded to the echo.

Then there were calls for Mr. Clare, the Chairman of the Exhibitors' Committee. In the course of his remarks, he expressed the opinion that Mr. Helps's famous "trinity" had had wondrous good results. That trinity was strong in its constitution; and all of its parts had worked together to the best of their ability to make the exhibition the success that it had been. Another thing which had added to the success of the exhibition was that the Institution of Gas Engineers had not seen fit to issue competitive medals. This had saved a good deal of heart-burning. Each exhibitor had done the best he could to make the exhibition a grand success; and therefore it would have been an invidious distinction to name one maker above another for recognition. As contributing to success, he recognized the part that friends from abroad had taken in (at great expense and trouble) bringing their exhibits to Earl's Court; also the material assistance that the lectures and demonstrations had been; the good fellowship that had prevailed among the exhibitors and their representatives; the work of the Press—especially of the gas papers; and, last but by no means least, he did not forget the public who had attended in such large numbers. They had had a wonderful demonstration of power, light, and heat. Mr. Clare put a little emphasis on "heat." As Chairman of the Exhibitors' Committee, he thanked Mr. Helps and his colleagues for their kindness to him both during the preliminary work and the run of the exhibition, and for the confidence they had reposed in him. His post had been one of great pleasure, and also of "masterly inactivity."

Succeeding this, Mr. Helps proposed a vote of thanks to Messrs. Bridges and Smith, remarking that without them it would have been impossible to bring the exhibition to such a successful issue. The seconder was Mr. J. W. Glover; and all present cordially acquiesced in it. Mr. Bridges responded, and frankly acknowledged how much he and Mr. Smith were indebted to Mr. Helps for his wonderful tact and genial manner and assistance, as well as to the other members of the Advisory Committee. Then Mr. A. W. Onslow proposed a hearty vote of thanks to Mr. Webber, remarking that perhaps the exhibitors had not seen so much of the work of the Secretary of the Advisory Committee as the members of that Committee had done. Mr. Clare, on behalf of the exhibitors, followed this up by proposing a vote of thanks to Mr. Helps and his Committee. After this, Mr. Bridges took the opportunity of seconding the vote to Mr. Webber, who, in his response, mentioned that, when he was asked to join the Committee, and go in for the exhibition, he said that nothing should be spared

that he could suggest or try to carry out to make a really good, grand, and—well, a blazing success. Mr. Helps contented himself with a simple appreciative remark, but went on to speak of the indebtedness of all to the President of the Institution for the great interest he had taken in all matters relating to the exhibition. He honoured Mr. Irving for the attention he had paid to the work; and everyone present, he was sure, highly valued it. He proposed that a cordial vote of thanks be passed to Mr. Irving. This was carried by acclamation; and the President's thanks, and brief expression of the pleasure he had derived from, and pride that he felt in, being associated with such a brilliant success as the exhibition had been, ended the speech-making.

The band of the Irish Guards struck up "Auld Lang Syne;" the members of the Advisory Committee, and manufacturers and their representatives chained hands indiscriminately, and with the utmost heartiness sang the good old song. The National Anthem was succeeded by three resounding cheers, and very shortly afterwards the buildings were closed, to only reopen again to commence the dismantling of what has been an unprecedented display of the power, resource, and resplendence of the gas industry.

Sir George Livesey.

After his illness and his short stay at Eastbourne recruiting his health, Sir George Livesey was actively engaged again last week in and about the affairs of the South Metropolitan and South Suburban Gas Companies; and wherever he went, his friends and all who knew him, gave him most cordial greeting. Sir George was a visitor to the exhibition on Thursday; and expressed to friends, in unstinted terms, his admiration of the display.

An Appreciative Letter from M. Visinet.

If anyone who was present at the reception of the Continental gas engineers at Earl's Court on the 6th inst. entertains the least doubt as to the heartiness of their appreciation of the efforts of the Institution of Gas Engineers to make their short visit to this country as full as possible of pleasurable recollections, the following translation of a letter received by Mr. Irving from M. Visinet, the President of the Société Technique de l'Industrie du Gaz en France, should go far to dispel it:—

Paris, Dec. 13, 1904.

Mr. Irving, Bristol, England.

Dear Sir and President,—On our return to France, I desire to thank you, in my own name and in that of my colleagues of the Société Technique for the delightful reception which you accorded to us in London. We were charmed with our sojourn, and with our visit to the exhibition at Earl's Court. I can only express to you my deep gratitude for your kindness, and assure you that we shall preserve an ineffaceable remembrance of it. Please convey our thanks to your colleagues in the Institution of Gas Engineers, and accept, my dear President, the assurance of my most distinguished sentiments.

(Signed) GEORGES VISINET,
President of the Société Technique.

M. Visinet speaks in the name of the Society with which he is immediately connected; but we think the Institution are justified in taking the letter addressed to him as voicing the sentiments of the representatives of all the other foreign Gas Associations.

Manchester and Other Exhibitions.

As mentioned in the extended account above of the doings at Earl's Court on Saturday, the exhibitors have decided, for several reasons, not to entertain for some time to come, suggestions for further displays. Unless, therefore, there is some change, Manchester will not see them next autumn. Mr. Clare, the Chairman of the Exhibitors' Committee, has been requested by the latter to communicate the decision to Mr. H. Kendrick, the Secretary of the Manchester District Institution of Gas Engineers.

Prior to the above decision of the Earl's Court exhibitors, Mr. Kendrick, in conformity with the resolutions at the informal meeting of Manchester members (reported in the "JOURNAL" last week), sent out a circular to manufacturers announcing that the Committee of the Manchester Institution had under consideration the advisability of holding a gas exhibition in Manchester next autumn "on similar lines" to that at Earl's Court, and inquiring whether the Institution could, in the event of such an exhibition being organized, rely upon the support of the recipient. A second circular was addressed to the members, stating the opinion of the members present at the Earl's Court meeting on Dec. 9, asking for an expression of views as to whether the time proposed was considered opportune, also as to the amount of support that each member could obtain from his Committee or Board, and inviting remarks or suggestions. Whether the matter will be persevered in, in view of the decision of the Earl's Court exhibitors, we do not yet know.

In reference to Mr. Kendrick's speech at the meeting reported last week, Messrs. Bridges and Smith have asked us to deny that there was any intention on the part of Mr. Smith to "rush" the matter of an exhibition in any way. Nor in regard to the interview was he anxious to see Mr. Kendrick as soon as he put foot inside the exhibition. All he desired was an opportunity of conferring with him before he left the buildings. Mr. Smith declares that he really desired to protect not only his firm's interests, but those of Manchester by moving early, so as not to be forestalled by other towns and those promoters who are always to be found ready to take advantage of other people's successes.

Medals.

Mr. Helps, as already noted, announced to the exhibitors on Saturday night that the Advisory Committee were having a special silver medal struck for them as "a souvenir of successful co-operation." It did not, of course, come within the province of Mr. Helps to add that the members of the Advisory Committee are having one struck in gold for the man who, as Chairman of the Advisory Committee, had put heart and soul into the work of organization and management.

The Interest of Consumers.

Mr. C. W. Offord, the Secretary and General Manager of the Enfield Gas Company, sends an interesting letter that he received last week from one of the Company's consumers. We reproduce it as showing the interest taken by consumers in the exhibition: "Dear Sir,—Thank you for the tickets for the Gas Exhibition, which I visited yesterday, and found to be exceedingly interesting. In all large towns, cooking by gas ought to be made compulsory, and those abominable kitcheners abolished. If the gas companies and the makers of gas-stoves would combine to bring more pressure upon the L.C.C., and large building firms to fit up all houses with gas cooking-stoves, including hot-water boilers, instead of kitcheners, it would be a national blessing—such a purification of the air by the stopping of smoke from thousands of chimneys and great cleanness and comfort to the householder. I am, Sir, Yours faithfully, ———."

Ironmongers and Gas Suppliers.

At the request of the Ironmongers' Federated Association, and the London and Suburban Ironmongers' Association, the Advisory Committee of the Institution of Gas Engineers, met a deputation of these bodies at the Earl's Court Exhibition, on Monday last week, to discuss, in an informal way, the relative positions of gas companies and ironmongers in connection with the gas industry. The outcome of the interview was, that the Chairman of the Advisory Committee (Mr. Helps) promised, on behalf of the Committee, to submit the views of the deputation to the next meeting of the Council of the Institution, and that the matter should have careful consideration. The interview was brought about at the suggestion of Mr. Bridges.

PERSONAL.

Mr. WILLIAM NEWBIGGING, who was recently appointed Gas Engineer to the Macclesfield Corporation, in succession to his late brother, will also fill the position of Water Engineer.

At the meeting of the Institution of Civil Engineers last Tuesday, Mr. D. IRVING, of Bristol, the President of the Institution of Gas Engineers, was raised from the position of associate to that of member.

At the last monthly meeting of the Padiham District Council, Mr. HARRISON, of Brigg, was appointed Gas Manager, at a salary of £130 per annum, in addition to £24 as an annual grant in lieu of house, gas, rates, &c. Mr. Harrison succeeded at Brigg Mr. C. J. P. Wadman-Smith, who resigned the position in June last year to occupy a similar one at Skegness. Mr. Harrison's new appointment takes effect on the 31st prox.

Failure of a Reservoir.—We learn from the "Engineering Record" that a strange reservoir failure recently happened at Red Wing (Minn.) demolishing one house and a barn and doing some damage to yards and cellars. Mr. G. H. Herrold, the Division Engineer of the Chicago Great Western Railway, informed our contemporary that the structure was a covered reservoir 80 feet in diameter and 26 feet deep, excavated in a bench of a high bluff in the east part of the town, about 250 feet above the river. The floor of the reservoir was the solid limestone of the hill, covered with a coating of concrete. The leak was caused by a fault in the natural rock floor. The throw of the fault was small; but it was sufficient to allow the breaking up of the concrete, and the water poured into the crevice until the pressure was so great as to burst out the face of the hill about 40 feet below the bottom of the reservoir. The basin was full at the time of the accident, and it emptied itself in a very few minutes. The only apparent damage is the open crevice, about the width of one's hand, running across the bottom. After the first burst of the water through the hill side, the rock settled down over the aperture, and the rest of the water was forced through it in small streams. The face of the break was about 40 feet long and 12 feet wide.

SUPPLY OF GAS TO TRUSTEES IN BANKRUPTCY.

It may be remembered that, in the early part of 1902, an article appeared in the "Journal" dealing with the "Legal Relations between Gas Supply Undertakings and Consumers," in the course of which it was suggested that it might be advisable for a gas company to take the opinion of Counsel upon the position of a Trustee in Bankruptcy in regard to obtaining a supply of gas without being required to pay arrears due from the bankrupt. At the last meeting of the Gas Companies' Protection Association, one of the speakers brought the matter before the members; and we have received from the Secretary (Mr. F. E. Cooper) the following questions submitted to Mr. Shiress Will, K.C., with his replies.

Question 1.

Is a trustee in bankruptcy who carries on the bankrupt's business on the premises theretofore occupied by the bankrupt entitled to a supply of gas to such premises in a case where the bankrupt, at the time of adjudication, was indebted to the gas company for gas supplied to such premises, without being required to pay the gas-rents in arrear? In other words, is a trustee under such circumstances an "incoming tenant" or a continuing tenant or caretaker?

Reply.

As to the first part of this query, I am of opinion that the same must be answered in the affirmative. As to the second question in the query, I am of opinion that a trustee in bankruptcy is, in the circumstances stated, a "next tenant" or incoming tenant, and is not a continuing tenant or caretaker. The point of distinction between a receiver and a trustee in bankruptcy is as follows: A receiving order does not divest the debtor of his property, which property remains in the debtor until adjudication in bankruptcy (*Rhodes v. Dawson* [1886] 16 Q.B.D., 548); while, on the other hand, the appointment of a trustee vests the property of the bankrupt in the trustee by virtue of section 54 of the Bankruptcy Act, 1883. Accordingly, in cases where there was no adjudication in bankruptcy, but only a receiving order or an order appointing a receiver and manager, it has been held that in such cases the Company are entitled to cut off for non-payment of arrears, because the receiver is only the caretaker of the tenant. (*Exparte Mason* [1893], 1 Q.B., 323; *Paterson v. Gaslight and Coke Company* [1896], 2 Ch., 476; and *Husey v. Gaslight and Coke Company* [1902], 18 T.L.R., 299. I now come to the case of *In re Flack, ex parte Berry* [1900], 2 Q.B., 32. Although this case was decided under the Metropolis Water Act, 1871, it raised the very question now under consideration—viz., the difference between the position respectively of a receiver in bankruptcy and a trustee in bankruptcy. Wright J. observed: "Now, here the debtor, on being adjudicated bankrupt, ceased to be the tenant or occupier of the shops which the trustee then took possession of with the view of carrying on the business for the benefit of the estate. The trustee therefore was in the position of an incoming tenant. . ." (See at p. 35.) With regard to section 50 (2) of the Bankruptcy Act, 1882, which provides that "the trustee shall, in relation to and for the purpose of acquiring or retaining possession of the property of the bankrupt, be in the same position as if he were a receiver of the property appointed by the High Court, and the Court may, on his application, enforce such acquisition or retention accordingly," I am of opinion that this enactment does not alter the distinction which I have above pointed out between a receiver in bankruptcy and a trustee in bankruptcy as regards the vesting and divesting of the property of the debtor. What the enactment does is to clothe the trustee with all the special powers of a receiver of property appointed by the High Court. A receiver thus appointed by the High Court is an officer of the Court, and enjoys special powers, and protection. As to these, see "Seton on Judgments," Sixth Ed., pp. 773-791; "Kerr on Receivers," Fourth Ed., pp. 176-201.

Question 2.

If Counsel's answer to Question 1 be in the affirmative, is the gas company entitled to receive from the trustee notice requiring a supply of gas, as provided by section 11 of the Gas-Works Clauses Act, 1871, and to security for future gas-rentals, as provided by such section?

Reply.

I am of opinion that the trustee in bankruptcy ought, before using the gas, to serve the notice required by section 11 of the Gas-Works Clauses Act, 1871, specifying the premises, and specifying the day, being a reasonable time, when a supply of gas is required by him; and I am of opinion that it is the right of the company to require him to give security for the payment in respect of gas to be supplied by them. As the supply-pipes are already on the premises (in the case assumed), the written contract spoken of in this section is unnecessary, as is security in respect of such supply-pipe.

Question 3.

If Counsel be of opinion that a gas company are entitled to notice under the said section 11, is the trustee liable to the penalty imposed by section 15 of the same Act for connecting a meter with a pipe, and that even though the connection be merely caused by turning on the supply at the meter?

Reply.

If the trustee in bankruptcy failed to give the notice, I am of opinion that he would not be liable to the penalty imposed by section 15 of the Gas-Works Clauses Act, 1871. The circumstances contemplated in this query would not, in my judgment, fall within section 15. I am, however, of opinion that the penalty imposed by section 18 of the Act of 1847 on any person "who shall otherwise improperly use or burn such gas" would attach. This point would be a novel one; but I am of opinion there is substance in it, because if the required notice were served, the company would be able to examine the meter register, and so fix the respective liability of the debtor and trustee.

Reply on General Question.

I may add that occasionally there is to be found in a Special Act of a gas company an enactment authorizing them to recover gas-rents and charges due to them for gas supplied "by the same means as landlords are by law empowered to recover rent in arrear." Under such a power, a gas company may lawfully distrain, after commencement of bankruptcy proceedings, for gas supplied prior thereto. (*Ex parte Birmingham and Staffordshire Gaslight Company, in re Fanshaw* [1871], L.R. 11 Eq., 615; *Ex parte Harrison, in re Peake* [1884], 13 Q.B.D., 753. See section 42 of the Bankruptcy Act, 1883.)

SUGGESTED INSTITUTION OF GAS-WORKS CONTRACTORS AND MANUFACTURERS.

We have received the following further letter on this subject.

Sir,—As one of the minority opposed to the recent dissolution of the Gas Institute and the elimination of the "trading element" therefrom, who warned that body of its retrograde policy, reproached it for ingratitude to its benefactors, and appealed for the abandonment of narrowminded procedure, I indulge the hope that you will allow me a little space to express my views on the proposal to organize the traders and contractors engaged in the gas industry—especially as during the period of the International Gas Exhibition just closing, I was cruelly mistaken for a namesake whose recent oral and written strictures on the above gentlemen do not appear to have been appreciated. That I—the originator of the policy of enlisting in its ranks and gathering within its portals and consolidating all gas interests in an Imperial Society, and one who entertains the highest opinion of the nobility of trade and commerce, and does his level-best to exalt them—should be confounded with those who liquidated the Society in order to expel traders, and who inconsistently proceeded to elect a trader as one of the first honorary members, is extraordinary. But it is so; and I desire to dispel the illusion, and maintain my identity. When Shakespeare endeavoured to minimize the importance of a name, he unconsciously inflicted a wrong on the numerous family (to say nothing of its derivative branches) rejoicing in the name of the undersigned, for which I entertain no doubt that the dramatist is now sorrowfully penitent.

Without the aid morally and materially of gentlemen engaged in trading pursuits, there would have been no British Association of Gas Managers, the founders of which wisely followed the example of other Societies in opening its ranks to those whose scientific attainments and inventive, technical, and commercial efforts have done so much to develop the gas industry. And now in these degenerate days I find the honoured name of Cutler, which adorns the corporate roll of the Institution of Civil Engineers, the Mechanical Engineers, and kindred Societies, is no passport to a banquet of gas engineers given in honour of our foreign *confreres;* and dignified company which would have graced the proceedings were disqualified because of their association with the Millwall works! And this after making a manufacturer of lamps and burners an honorary member of the new Institution! This episode, I may say, nearly led to the formation of another Gas Institute in opposition to that professing to represent an united gas industry; and the accomplishment of the idea, aided by discontent among a section of members, is by no means chimerical. My suggestion is that traders (who, by the way, are admitted to Provincial Societies) should, like them, be affiliated to the Institution of Gas Engineers, and in a similar manner.

The principle of excluding traders has been sacrificed. It no longer exists. Why, then, strain at a gnat and swallow the camel? Let a conference be called and the views of the members ascertained; and if I can be of any assistance in establishing such a branch, I shall be glad to be of service.

Leyton, Dec. 16, 1904. Charles Edwin Jones.

Masonic.—Bro. C. W. Offord was installed W.M. of the Enfield Lodge, No. 1237, on the 12th inst., and was honoured by the presence of the Provincial Grand Master for Middlesex (Lord George Hamilton), the Provincial Grand Secretary, and a large number of other officers of the Province (including Bro. Colonel H. F. Bowles, M.P.), and a representative of the Grand Lodge of England.

THE GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 934.)

THE centre of interest has again been in the American Market, where the excursions and alarms of an audacious operator have provoked admiration and dismay. Next to that came the South African; and the rest were mostly quiet. The general tendency was firm; but fresh business was quiet, and the heavy settlement was the most serious consideration. So far, it seems to have gone through satisfactorily. In the Money Market there was a good demand, which stiffened rates; but the supply was equal to all requirements. Discount rates were steady. Business in the Gas Market was remarkably brisk; and Gaslight and Coke ordinary never perhaps had such an active week since its conversion. Prices, too, were good all round; and a large number of issues have advanced their quotations, some being to a considerable extent. Gaslight ordinary marked 98¼ on Monday, the next day it touched par, and on Friday it changed hands at 100⅜—the best price of the week. Be it noted with approbation that the quotation is now drawn in to a one-point margin. The maximum marked 91⅛ to 92½; but the quotation did not rise. The preference advanced; transactions rising from 108½ to 110⅞. The debenture ranged from 89 *cum. div.* to 86⅜ *ex div.* South Metropolitan was more active than of late, and very firm. Transactions were marked at prices from 129 to 132. Not much was done in Commercials—one bargain in the 4 per cent. at 114, and one in the 3½ per cent. at 111½, being all; but there was a smart rise in the quotation. Much more than usual was done in the Suburban and Provincial group. Alliance new marked 14 3/16, and Bournemouth "B" from 15⅞ to 16⅛. Brentford old was done once at 250, and British once at 40¾. Brightons were not dealt in; but both issues had an advance in quotation. Bromley "A" changed hands once at top price, 122. South Suburban ordinary fetched 122½. Southampton was done at 105 and 105½; and the quotation was drawn in closer. Tottenham "B" was done once at 98. West Hams were quite active and were very firm. The ordinary marked transactions at from 99½ to 100½, and the preference from 121 to 123½; the quotation of the latter having been advanced three points. The Continental Companies were rather quiet on the whole, though Union came in for some notice of a favourable character. The ordinary stock had a smart rise, and transactions ranged from 113½ *cum. div.* to the same figures *ex div.* The preference realized 140 and 141 *cum. div.* Imperial was very quiet, with not half-a-dozen dealings all told. The prices were middling—from 206 to 207. European was very quiet, with only one bargain in the fully-paid shares at 20¾. There were a few movements among the undertakings in the remoter world. Bombay was marked at 6½, Buenos Ayres at 11½, Cape Town ordinary at 15⅛ and 15¼, and the preference at 9⅜. Monte Video was done at 10½, and River Plate twice at 11⅞. San Paulo debenture advanced a couple of points; but no transaction was marked. The quotation of Primitiva ordinary was lowered, without business done in it; the preference changed hands at 4⅞ twice, and the debenture was done at 94½.

The closing quotations are shown in our stock and share list.

ELECTRIC LIGHTING MEMORANDA.

The Bradford Disaster—Electricity Supply Outside the Statutory Area—An Analysis of Consumers and Consumption.

SOME of the electrical papers have been amusing themselves lately—and they have a perfect right to do so, as it is following our own example in relation to electricity supply—in duly announcing accidental and other shortcomings of gas; but of three electrical papers which we have looked into this week, only one—the "Electrician"—has seen fit to make editorial comment on the complete breakdown of the electrical supply that happened in Bradford last Thursday week, and upon which a report has already appeared in the "JOURNAL." The inconvenience into which the entire city was plunged, and for a whole day and night, was alone sufficient to justify the appellation of "disaster;" but there was everything in the occurrence to make one shudder in thinking of the possible consequences if the City Electrical Engineer and the City Gas Engineer (Mr. Charles Wood) had not energetically and with coolness dealt with the emergency. The facts were stated last week, and so do not require to be recapitulated here. But it appears, according to the "Electrician," that the whole failure was attributable to the gradual deterioration of the cables, and that no adequate steps had been taken to arrest its progress. The cables involved were laid, we learn from another source, some 8½ and 16 years ago; and, while the matter must not be prejudged until there has been a full inquiry into the catastrophe, it is so evident, on the face of the facts so far revealed, that it may be generally said there has been a deplorable neglect in connection with this particular distribution system. To whom the responsibility for this neglect is chargeable, has yet to be ascertained; but it is a point to be noted that the present Electrical Engineer has only occupied his position for something like twelve months. The technical aspects of the occurrence have no special concern for us. But it is not comfortable to learn that the deteriorated cables which caused all the mischief reposed in close proximity to a large gas-main; and that pieces were actually fused out of that main. There was a series of explosions of a more or less destructive character; but if there is one pleasant feature about the occurrence, it is that there was no loss of life. We hope that the lesson of this Bradford catastrophe will be heeded, and that there will be an immediate examination and overhauling of old electrical systems everywhere, and that periodical tests will be made and everything possible done to avert such serious disaster in the future.

The Stourbridge District Council are being kicked from pillar to post by the Local Government Board over their electric lighting scheme. As we mentioned some time since, upon an application for a loan, the question was raised at the local inquiry as to whether it would not be a cheaper plan for the Council to obtain a supply in bulk from the Midland Electric Corporation; and the Council were advised to consider the matter, and then renew their application to the Board. They again deliberated, remodelled their proposals, and then applied for a loan to carry out the modified scheme, which they certainly had the right to expect would be accepted by the Board, founded as it was on the advice tendered to them by one of the Board's own Inspectors. The result is the unexpected one, that now the Board are convinced that this Power Company, working under Provisional Orders, have no right to furnish electricity outside their prescribed area. This is no doubt an echo of the case in which the Willesden District Council and the Metropolitan Electric Supply Company were recently concerned. But, the case is not analogous, as the Metropolitan Company were selling electricity in the statutory district of the Willesden Council; in the Stourbridge case the Borough Council are willing purchasers of electricity for distribution in their own statutory area. Of course, the difficulty can be overcome by the Power Company obtaining legislative sanction to an enlargement of their powers; and it will not harm Stourbridge to wait a bit longer. The question raises an interesting point for consideration in those districts where electrical suppliers are doing, without asking anybody's leave, precisely that which the Local Government Board will not now countenance the Midland Company doing at Stourbridge, without first obtaining parliamentary authorization.

Who are the consumers of electricity for lighting purposes, and who are the largest consumers? So far as West Ham is concerned, these questions are answered, in an instructive manner, by a return which has been presented to the West Ham Borough Council. It is seen from it that public buildings and shopkeepers are the best customers; and that private users make a very poor show in comparison. Public buildings to the number of 35 were the largest users; their total consumption amounting to 222,343 units during the past year. The wealthy public house keepers come next; their number being 38, and their consumption of electricity reaching the noble figure of 196,036 units. Succeeding the public houses are 70 drapers, who combined account for 150,694 units. Two theatres and music halls patronize the electricity supply to the extent of 80,065 units. Then 49 butchers require 76,294 units; while seven co-operative society buildings take 71,561 units. The needs of 113 private consumers (113 is a surprisingly small proportion) are satisfied with 62,682 units; while 39 grocers consume, all but 254 units, as much as the 113 private ones. Twelve restaurants give their custom to the extent of 41,396 units; and 23 bootmakers, to that of 37,729 units. The year's accounts of 14 pawnbrokers total to 36,731 units; those of 22 tailors, to 35,980 units; and those of 17 bakers, to 22,059 units. Tobacconists to the number of 20 use 21,368 units; five oil and colour shops, 20,828 units; and 14 watchmakers, 20,397 units. There are twelve factories who consume 18,295 units; two public halls, 16,890 units; and six clubs and institutes, 16,531 units. These figures all refer to last year. Now omitting the public buildings, and grouping together all the business establishments, places of amusement, clubs, &c., it is found that there are 352 consumers in this category, as compared with the 113 private ones. It is noticed, too, that the average consumption of the private consumers works out to a low point in comparison with the other classes of custom. In connection with these figures, it may be noted that the consumers of West Ham—although efforts have been made recently in various quarters to prove the advantage to electricity users—do not like the maximum demand system; and their objection must have been of a very pronounced character, seeing that it is dignified by the descriptive term of "an outcry." The Borough Council, wise in their generation, have readily acquiesced in the flat-rate system of charge being adopted as an alternative.

Formation of Alkali Cyanides and Cyanamides.—According to a patent granted to the Deutsche Gold and Silver Scheide Anstalt (vorm. Rössler), carbon reacts with soda amide or potass amide at 350° to 400° C., forming the metallic derivatives of cyanamide, $2\,Na(NH_2) + C = Na_2N_2C + 2\,H_2$. Hydrocarbons may be employed in place of free carbon, or the alkali metal may first be fused, the requisite quantity of carbon then added, and ammonia passed into the mass; the temperature being maintained at first at 400° C., and then, as the cyanamide is formed, gradually raised to 600° C. On heating further to 800° C., formation of sodium cyanide takes place thus: $Na_2N_2C + C = 2\,NaCN$ (sodium cyanide). The sodium or potassium may also be employed in the form of an alloy with lead.

A CHEAP WAY TO USE COAL TAR FOR THE IMPROVEMENT OF ROADS.

By N. C. Hoogvliet.

We have been favoured by the author with the following translated extract of a contribution he made to the columns of our Dutch contemporary "Het Gas."

For gas manufacturers, there is nothing new in the fact that a road, pathway, or other surface covered with gravel or coal ashes, when treated with coal tar, assumes a hard and somewhat elastic substance—indeed, forms a kind of asphalt pavement. At every gas-works there are roads or parts of the grounds that are treated in this way. Outside the gas world, however, this useful property of our bye-product is still very little known—at least, the use that is made of it for improving roads is at present very limited. This fact is the more remarkable as it is obvious that a thorough improvement of most of our country roads, by which they should lose their sloppiness and softness in wet weather, as well as their dustiness during dry periods, cannot be termed a luxury. It is true there have recently come into use some dust-reducing substances—petroleum-refining residuals, &c., and some patented preparations that can be mixed with water and so distributed on a road, in a diluted form, by ordinary watering carts. The high price of these substances and preparations is, however, a serious impediment to their more general application; and when they are applied, it is usually in such homœopathic doses that their effect becomes problematical, or at any rate is limited to a more or less successful reducing of the dust plague.

Now the prodnct of our gas-works, tar, is very cheap; its only drawback in respect to its use on roads being its disagreeable stickiness and viscosity, which makes it a very difficult job to distribute evenly a small quantity of it over a large surface. In special cases, where expense is no objection, a very beautiful, hard, and clean surface may be obtained by pouring ordinary tar (heated previously, to eliminate most of the water and volatile matters) on a gravel or macadamized road, spreading and smearing this out evenly by manual labour, covering with a layer of sand, and rolling. The great cost of such a job, however, makes it highly improbable that this method will ever be applied to any very extensive stretches of road.

The problem that I put to myself was how to so modify the physical properties of the tar that it should lose its stickiness, and become capable of being distributed as evenly over a great surface as water, and like water to permeate the superficial parts of a road. In the laboratory, I very soon succeeded in emulsifying the tar—that is to say, getting it in a finely divided form suspended in a weak solution of some additional substances, in the same manner as in milk the microscopic particles or drops of butter are suspended in the whey. These additional substances are cheap; and the process of road-improving by this tar emulsion is very simple and cheap too. It can be distributed by ordinary water-carts, or on a smaller scale by watering-pots. The cost of manufacturing the emulsion on a somewhat large scale is very small too.

As to the results obtainable by it, I can cite here a successful experiment made at a great factory near the Hague, when a private road leading to the factory, which used to be in a very bad condition by the constant traffic of heavy carts, was treated with about 4½ gallons of the emulsion (containing something less than 1 gallon of original tar) per 100 square feet. This quantity was poured over it twice, with a few days' interval between each operation, and proved quite sufficient. The treatment took place in May; and during the whole of the summer the road remained as clean and hard as an asphalted thoroughfare. The rainy weather that followed the exceptionally long dry period of this year failed to make the road sloppy or soft; and it has retained its hard surface until now (December).

The Manager of the factory referred to (Mr. Joseph Koechlin, Director of Messrs. Nicola Koechlin and Co's flour mills, Gustbrug, near the Hague) will no doubt corroborate this statement on application being made to him (in English); and he will not have the slightest objection to admitting to his grounds visitors curious to ascertain the results obtained with tar in the form of an emulsion. With regard to my recipe, mode of preparing, &c. I shall be pleased, on application, to furnish particulars of them to all persons taking an interest in the subject.

1*a*, *Weimarstraat*, *The Hague*.

HAMBURG AND BERLIN LIGHTING STATISTICS.

The Association of Gas and Water Engineers of Lower Saxony held a meeting last September at Kiel, at which Dr. W. Leybold, the Chemist of the Hamburg Gas-Works, presided. In the course of an interesting presidential address, he cited statistics from the returns of the lighting undertakings of the City of Hamburg, which have a completeness not found in similar returns from towns in this country, because of the lack here of any census of lamps and burners, and of separate supplies for different uses. Hence English gas managers find a reference from time to time to the more exhaustive returns of typical Continental lighting undertakings affords them valuable information on the trend of business in gas and electricity which it would be difficult, if not impossible, to obtain from sources nearer home. At intervals in the past, suggestive abstracts of various Continental gas-works statistics have been published in the "Journal;" and we may now profitably supplement these with some particulars in regard to Hamburg and Berlin, culled from Dr. Leybold's address.

The city of Hamburg is showing rapid growth, and, accordingly, it is meet that the gas consumed during the last complete working year should show an increase of 6·66 per cent over the consumption for the preceding year. Nevertheless, the use of electricity for both public and private lighting showed a large increase also. In regard to private lighting, there was an increase in electric lamps equivalent to 16 per cent. on the number in use the preceding year—computing the numbers according to the equivalents of the various sizes in so-called 16-candle glow lamps—and an increase of 17·7 per cent. in the current taken for lighting purposes. The increase in the gas consumption for lighting only amounted to 5 per cent. The ever-increasing demand for light, and for greater light, is further illustrated by the fact that even the petroleum used increased by about 4·7 per cent.

The demand for gas for use in gas-engines showed an increase of 4·15 per cent.—a gratifying advance, because, in the preceding year, the consumption under this head had shown a slight decrease, due to the establishment of more electric motors and suction-gas producers. That the latter are not wholly trustworthy is shown by the desire of users to have a gas supply from the street-mains available for their engines in case of the failure of the supply of producer gas. The increase in the consumption of gas for cooking and heating purposes was as much as 16·58 per cent. Public lighting called for an increased consumption of 2·6 per cent., mainly due to the extension of building and road-making in Hamburg. The unaccounted-for gas and the works' consumption were considerably reduced by introducing incandescent burners wherever possible on the works, and by relaying some old and discarding some useless mains.

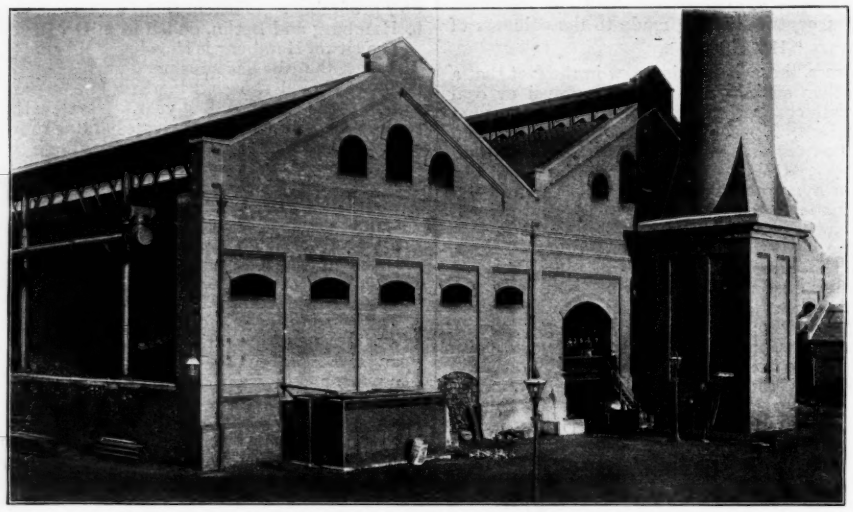
Perhaps the most instructive figures are those showing the progressive change in the relative proportions of gas consumed for lighting and other purposes. The ratio of gas sold for lighting (including public lamps) to that sold for cooking, heating, and power purposes was, in 1901, 1 to 0·43; in 1902, 1 to 0·47, in 1903, 1 to 0·51. In many German towns, indeed, the gas sold for lighting already amounts to less than that sold for other purposes. One consequence of this more rapid growth of the employment of gas for heating, &c., is that in towns where a higher price is charged for gas for lighting, there has been a gradual decline in the average receipts per 1000 cubic feet of gas sold. There is now a tendency in Germany to revert to a uniform selling price for gas for all uses; and such a system was introduced at Berlin in the spring of 1901. The change from the hitherto prevailing system of differential rates in that city wrought a decrease of 22·8 per cent. in the price of gas sold for lighting, but an increase of 23·5 per cent. in that sold for cooking, heating and power purposes. The gas sold in Berlin in 1900-01 under the differential prices yielded, on the average, about 3s. 11¼d. per 1000 cubic feet; and the uniform price charged in subsequent years has been 3s. 6d. The result was that while the total consumption in 1901-02 increased 8 per cent. as compared with 1900-01, the receipts showed a falling off of 4·84 per cent. The year 1902-03, however, showed an increase of 9·88 per cent. in gas sold, and of 10·47 per cent. in receipts, as compared with 1901-02. The population of Berlin increased by only 0·8 and 1 per cent. in the two years; and it seems certain that the introduction of the uniform (and lower) price has been the cause of the increase in the number of consumers and in the consumption of gas per head which has taken place in Berlin.

Coal was during the past year relatively cheap in Hamburg, but, unfortunately (said Dr. Leybold), the English export duty continued to be exacted, and Germany contributed immense sums towards it. The Westphalian coal supplies continued regularly throughout the year; there being no disturbances in the colliery districts. Many other matters (but of local interest) were discussed by Dr. Leybold in his lengthy presidential address.

The Marine Gas-Engine.—In a communication recently made to the "Glasgow Herald," a correspondent called attention to the use of gas-engines as marine propellers. It appears therefrom that some barges on German canals have been propelled successfully by this class of engine. But a more important venture is now in hand in England; Messrs. Holzapfel, on the Tyne, having a vessel of some 800 tons burden in course of construction for propulsion by engines supplied with coal gas made in suction gas producers. The coal required per horse power per hour is much less than with steam-engines; and this and the total abolition of the bulky and expensive high-pressure steam-boilers, with all their appendages, are two advantages which make the subject one of great interest. The chief objection at present to marine propulsion by gas arises from the fact that gas-engines are difficult to control in speed, and not easily reversible. Several means for overcoming the difficulty have, however, been proposed. Among others, the hydraulic jet propeller has been tried, by means of which the engine can run on while the boat may be stopped, started, or reversed.

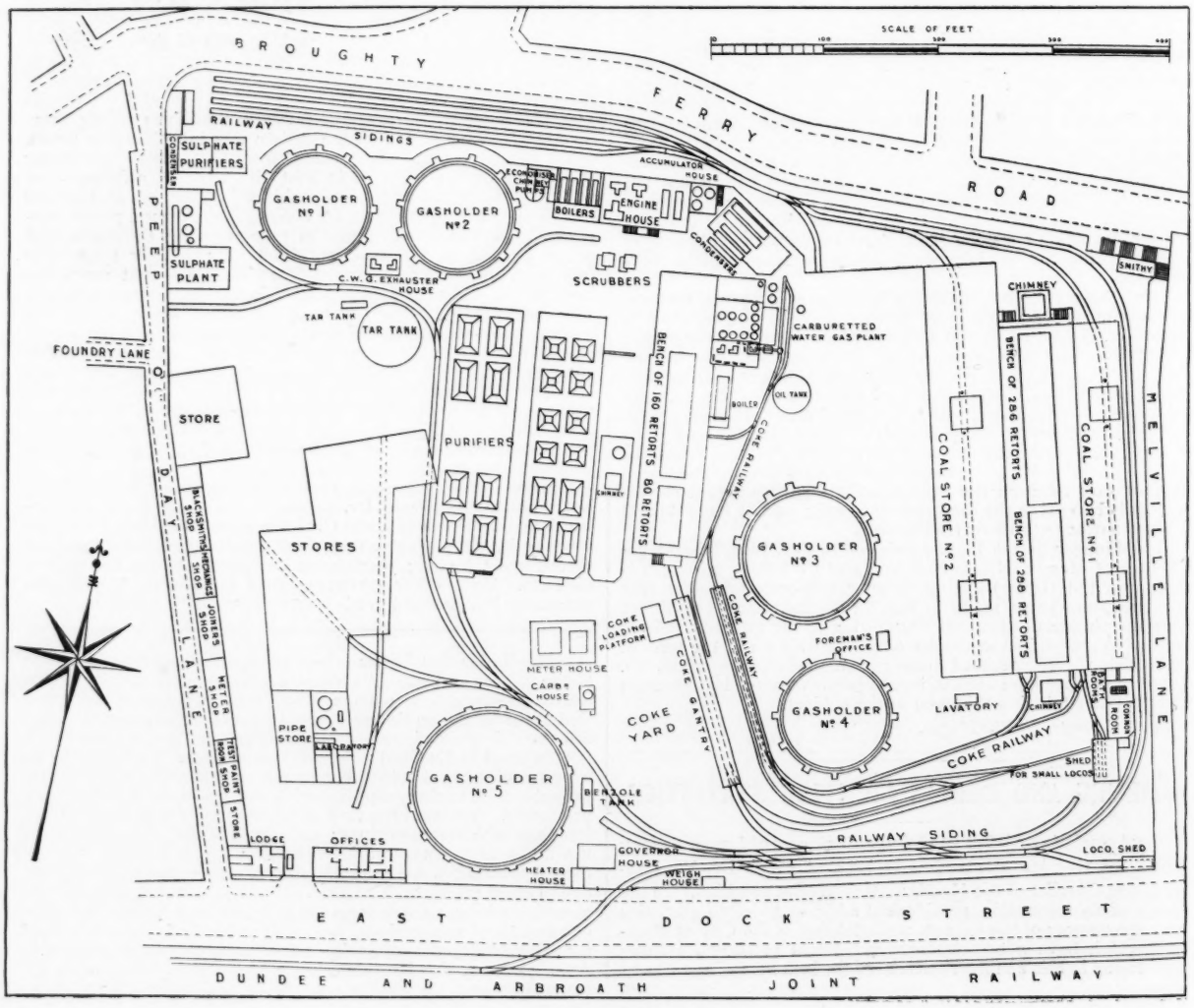
THE PROGRESS OF GAS SUPPLY IN DUNDEE.

How Requirements Have Been Met.

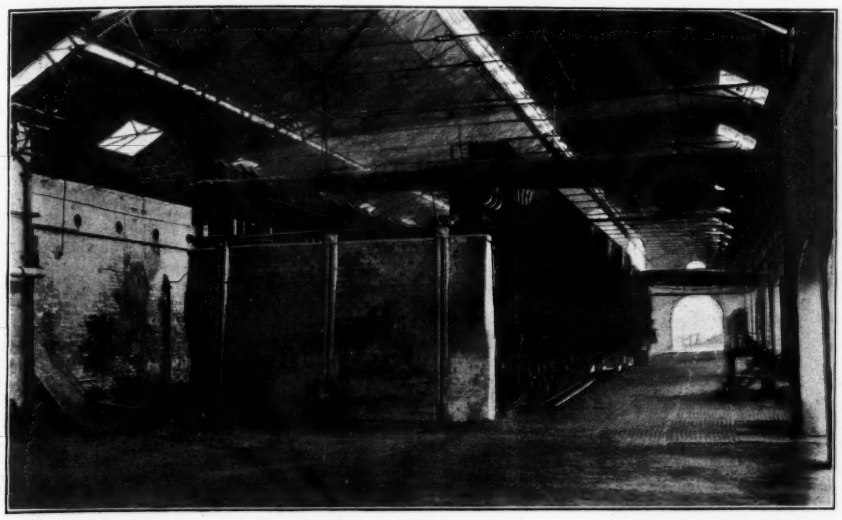


Exterior of the Retort-House and Coal-Stores.

As was briefly intimated in our "Notes from Scotland" last week, a booklet has been prepared for the Dundee Gas Committee by their Engineer and Manager (Mr. A. Yuill), showing the progress and present position of the undertaking. The occasion is an opportune one for such a review; a big scheme of reconstruction and extension of the works having lately been completed.



Plan of the Dundee Gas-Works.

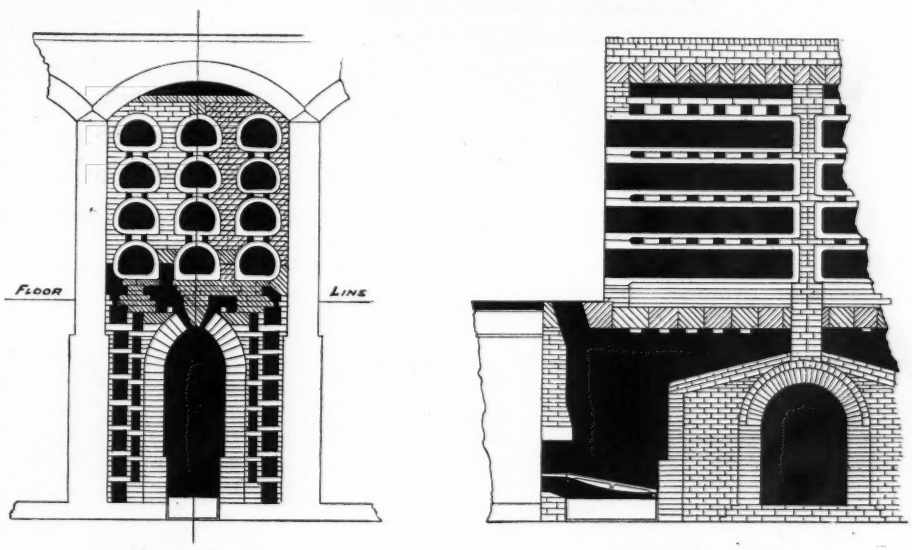


THE OLD RETORT-HOUSE.

It must be admitted, too, that the most has been made of the opportunity thus presented of demonstrating the value and usefulness of the property the town possesses in its gas-works. The pamphlet (which is attractively got up and excellently illustrated) will, of course, be eagerly studied in Dundee; but its contents have an even wider interest, as indicating the wonderful development of the industry, and furnishing an example of present-day gas engineering practice. It is with pleasure, therefore, that we avail ourselves of the opportunity of noticing the portions of the *brochure* which are of most general interest, and of reproducing some of the more distinctive of the illustrations.

The town was first supplied with gas by the Dundee Gas Company, in 1826; and four years later the Company went to Parliament and obtained an Act of Incorporation. One section of the Act provided that the gas should be of as good quality as that furnished by any other gas company in Scotland, and should be sold at as low a rate as the average price in Edinburgh, Glasgow, Paisley, Perth, Arbroath, Montrose, and Aberdeen. It is pointed out that at the present time the average of the prices in the places named is 3s. 0·52d. per 1000 cubic feet, as compared with Dundee's charges of 2s. 10d. per 1000 cubic feet, less 5 per cent., to ordinary consumers, 2s. 7d., less 5 per cent., for power, and 2s. 6d. net for public lighting. Unfortunately, no record was kept of the quantity of gas made during the earlier years; but the price charged was 15s. per 1000 feet.

Things went on smoothly until 1846, when another Company entered the field—with the usual result that the town paid the penalty when the two works were taken over by the Gas Commissioners. The two Companies vied with each other in obtaining business. There were, of course, distinct sets of mains and dual supplies to the consumers; while gas was sometimes made by one Company and payment for it received by the other, with the result that one year the unaccounted-for gas stood at 26 per cent. In 1830, the consumption was 7,484,000 cubic feet, for which the old Company charged 12s. per 1000 feet; but ten years later the output had increased to 27,330,000 cubic feet, while the price had fallen to 8s. 6d. In 1847, the two Companies were in operation; the old one selling 36,753,000 cubic feet of gas, and the new one 7,500,000 feet. The charge was then 6s., at which it remained until 1850, when the old Company's output was almost the same, while that of the new Company had increased to 18,660,000 cubic feet. In 1860, the price was reduced to 5s. 6d.; the output of the old Company being 58,165,000 feet, and of the new one 43,785,000 feet. During the next few years, there was a big expansion of business; the outputs of the two Companies in 1868 (the year of the transfer to the Gas Commissioners) being 103,893,000 cubic feet by the old, and 68,799,000 feet by the new the charge by this time having been

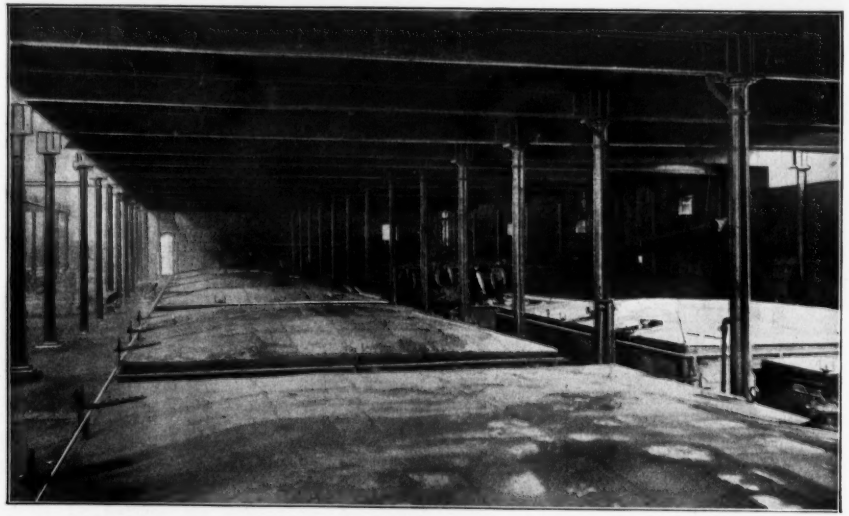


Sectional Elevation. Longitudinal Section.

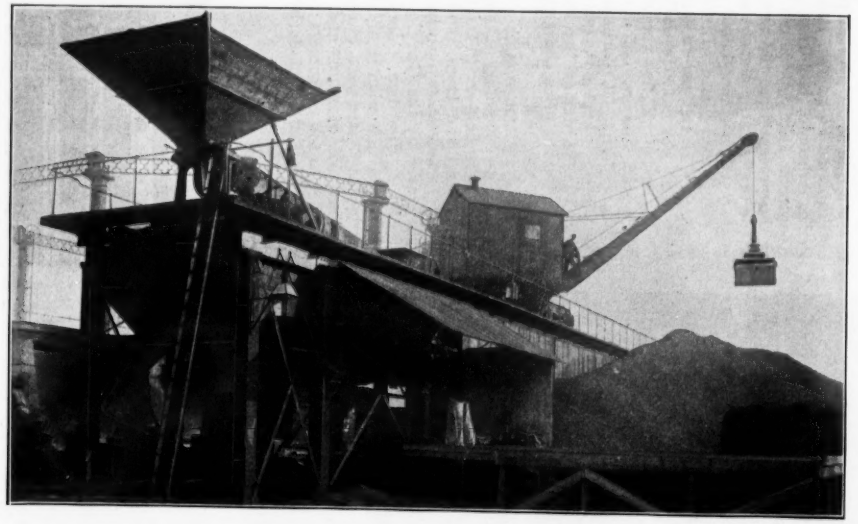
PLAN OF THE RETORT-SETTINGS.

INTERIOR OF THE NEW RETORT-HOUSE.

THE DUNDEE NEW GAS-WORKS.

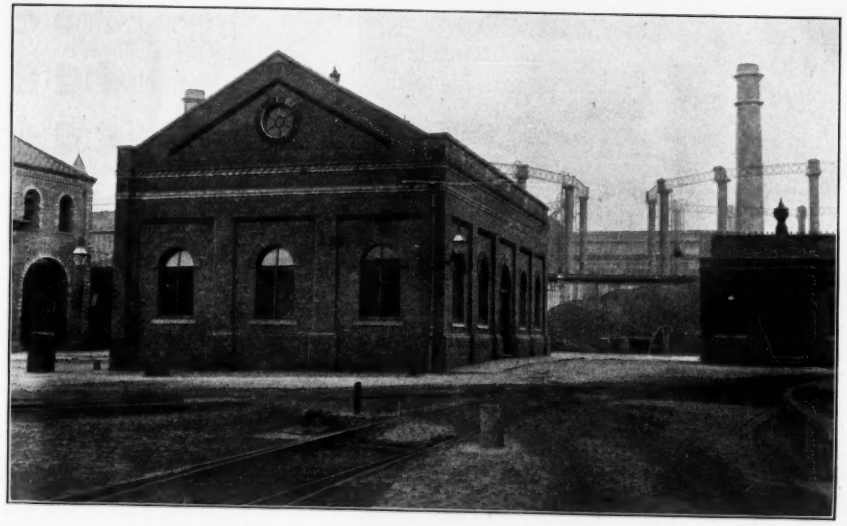


THE PURIFIER SHED AND PURIFIERS.

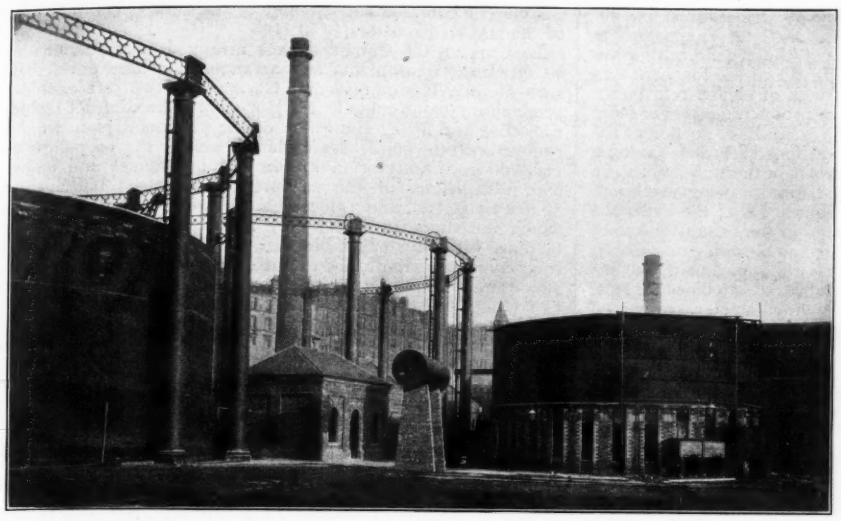


THE COKE GANTRY AND COKE-TANKS.

THE CONDENSERS, EXHAUSTER HOUSE, BOILER HOUSE, AND SCRUBBERS.



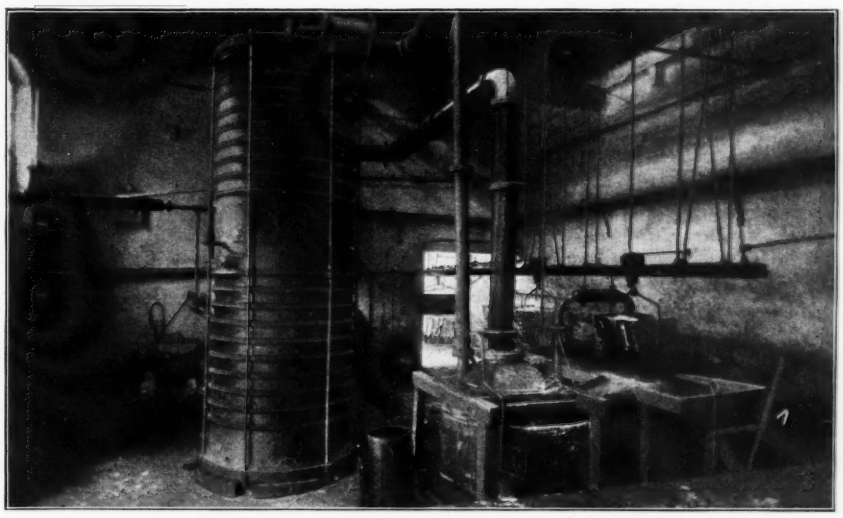
EXTERIOR OF THE METER-HOUSE AND CARBURETTOR HOUSE.



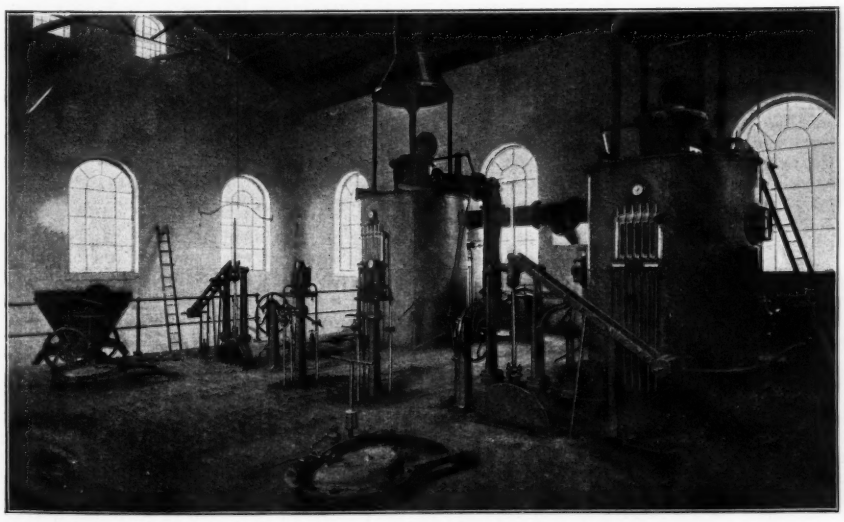
A General View of the Carburetted Water-Gas House, Tar Tank, &c.

lowered to 5s. 2d. per 1000 feet. The prices and consumptions at various periods since the taking over of the works by the town are as follows: 1869-70, 200,838,000 feet, at 5s. 1879-80, 340,489,000 feet, at 3s. 8d. 1889-90, 421,948,000 feet, at 3s. 6d. 1899-1900, 622,304,000 feet, at 3s. 4d. 1900-1, 611,452,000 feet, at 3s. 10d. 1901-2, 657,911,000 feet, at 3s. 6d. 1902-3, 665,202,000 feet, at 3s. 6d. 1903-4, 697,580,000 feet, at 3s. After the transfer, the Commissioners were somewhat hampered in the re-arrangement of the plant by the proximity of the works of the two Companies, as, of course, they had to deal with two works spread over the area with smaller units than if the works had been one completed whole.

At the time of the purchase, the old Company had £29,706 of original stock, and £50,000 of new stock; the annuities allowed being respectively £2875 (calculated at 9·677 per cent.) and £3250 (calculated at 6·5 per cent.). The new Company had £40,000 of original stock and £15,000 of new stock; the annuities granted being £1900 (calculated at 4·75 per cent.) and £637 10s. (calculated at 4·25 per cent.). The purchase price of the two undertakings was thus £8662 10s.; while the expenses of the transfer (including the cost of the Act and the arbitrations) were £37,532. By their Act of 1868, the Commissioners were authorized to borrow £40,000, on which a sinking fund of £1000 per annum was stipulated; and in 1872 a further Act was secured which permitted the raising of £60,000 on mortgage, on which a sinking fund of £1200 was fixed. In 1877, extra borrowing powers of £100,000 were obtained, with a sinking fund of £1500. This made a total annual sinking fund of £3700. But in 1882, power was obtained to add £3800 to this sum—the former amount being inadequate to redeem the £200,000 of loans or mortgages and the capitalized value of the annuities. In 1897, the Commissioners were authorized to borrow further sums not exceeding £150,000; and in 1899 another £50,000 was added; some variation of the sinking fund arrangements being made with reference to these two amounts.



Interior of the Sulphate of Ammonia House.



The Operating Floor of the Carburetted Water-Gas Plant.

Parliamentary powers were taken in 1901 to reduce the illuminating power of the gas to 15 candles. At the present time the Gas Commissioners supply gas of 20 candles.

In order to cope with the growing demands upon them, the Commissioners were, in 1899, obliged to reconsider the reconstruction and enlargement of the works; new ground to the east of the existing site being acquired for the purpose. The present area belonging to the Commissioners is about 13 acres for the works and $1\frac{1}{8}$ acres at Lochee, where a district holder is situated. Railway facilities were easily obtained, owing to the proximity of the Dundee and Arbroath Joint Railway; and a high-level railway was arranged to convey the coal to the new retort-house which has been erected. The total length of standard gauge railway at the works measures 3168 yards of single line; and to facilitate the delivery of coal, the Commissioners have sixty trucks trading to the various collieries.

The new retort-house measures 298 feet by 70 feet; and the two

coal-stores are 298 feet by 37 ft. 9 in. and 358 feet by 60 feet respectively, which gives accommodation for over 12,000 tons of coal. The retort-house is constructed on the regenerative principle, with stage floor; and the bench is in two sections, with 24 settings of twelve retorts and 26 settings of eleven retorts, set back to back, or 574 retorts in all, with a producing power of more than 4 million cubic feet of gas per 24 hours. Each section of the bench is furnished with a chimney 150 feet high, and having a diameter of 8 feet at the top. The retorts in the new house are operated by four hydraulic stoking and four drawing machines, working at a pressure of 450 lbs. per square inch; the hydraulic engines and accumulators being situated in the exhauster-house. There are also four sets of coal breaking and elevating machinery, with an engine for each, besides conveying apparatus from one side of the house to another in case of a breakdown on either side. Eight hydraulic waggon-lifting rams, 9 inches diameter, are worked from the hydraulic system which actuates the stoking and drawing machinery.

The condensers are of the annular form, with 24-inch connections. There are two sets having nine annular tubes each end, 30 feet high, the outside tubes being 42 inches diameter, the inside tubes 33 inches, and the diagonal tubes 12 inches; and three sets having ten annular tubes each and 25 feet high, the outside tubes being 30 inches diameter, the inside tubes 18 inches, and the diagonal tubes 10 inches. On both inlet and outlet, there are 14-inch controlling valves. The condensers are capable of dealing with over 5 million cubic feet of gas per 24 hours; while beneath them is a tar-well which will store more than 120,000 gallons. The separation of the tar and the ammoniacal liquor is effected in an overhead tank 40 feet diameter by 12 feet deep, from which the tar is run into tank-waggons, while the liquor gravitates through a filter to an underground tank 25 feet by 8 feet, from which it is pumped to the overhead tank at the chemical works for treatment.

The exhauster-house measures 74 feet long by 40 feet broad; and the main floor is composed of steel joists 5 feet above the ground, though all the gas valves and connections (24 inches diameter) are placed on the ground level. There are six exhausters, having a total capacity of 660,000 cubic feet per hour; and they are driven by engines fitted with governors, which control them according to the varying make of gas. A telephone has also been installed between the retort-house and the exhauster-house.

Adjoining the exhauster-house is the boiler-house, measuring 42 feet by 40 feet, in which there are four Babcock and Wilcox water-tube boilers, each of about 275 horse power, fitted with Meldrum's forced draught arrangement for the use of breeze or inferior fuels. A railway has been laid to the front of the boilers, so that a supply of fuel may be conveyed to them in waggons from the coke tanks by the Commissioners' own locomotive, instead of by carts as formerly. Alongside the house two boiler feed pumps are placed, as well as one of Worthington's 600-horse power water-heaters. A Lowcock patent economizer, with 256 4-inch pipes, complete with engine and scrapers and controlling dampers, has also recently been fixed. All the exhaust steam from the exhausters, hydraulic engines, tar and boiler feed pumps, scrubber engines, and the pumps in connection with the carburetted water-gas plant is conveyed to the water-heater, which receives the water from the feed pumps. The water then enters the economizer before passing to the boilers; and this it is anticipated will tend to economy of fuel. The boiler-house chimney is 150 feet high, and 5 ft. 6 in. diameter at the top.

There are two Holmes scrubber-washers. One is capable of dealing with 3 million cubic feet of gas per 24 hours, and the other with 2 millions. Each has an engine for working the revolving brushes, together with tar overflow and liquor pipes; and there are 24-inch valves and connections. The purifying shed is in two sections, each measuring 225 feet by 63 feet, with revivifying floor above, supported on cast-iron columns and steel girders. There are five sets of purifier boxes (or twenty in all), fitted with hydraulic centre-valves and controlling stop-valves at the inlet and outlet of each set. Three of the sets measure 30 feet by 20 feet, and two 20 feet by 20 feet. All have four tiers of grids; and the total purifying capacity is more than 4 million cubic feet per day. Both oxide of iron and lime are employed; and the spent material, when removed from the boxes, is elevated to the floor above, where the oxide is prepared for further use and the lime is conveyed to shoots and placed in waggons for removal from the works. The lime, when first received, is hydrated and prepared for the purifiers in adjoining sheds, and conveyed to the boxes as required.

There are two station meters, in a house constructed of ornamental brick, and measuring 53 feet by 33 feet. One passes 150,000 feet of gas per hour, and the other 50,000 feet. In this house are fitted the regulating bells for working the Foulis patent underground governors, which are located in a governor-house 200 feet away. One of these is 30 inches diameter, three 18 inches, and one 12 inches; each being provided with inlet, outlet, and bye-pass valves. The connecting-pipes from the bells to the governors are of lead, laid in brick troughs and covered over with bitumen. There are five holders at the works, and one at Lochee, with a collective capacity of 2¾ million cubic feet. The carburettor-house contains a Maxim-Clark carburettor capable, by means of benzol, of enriching by 1 candle 2 million cubic feet of gas per hour; and the connections are so arranged that the gas may be enriched at the outlet of the station meter, the inlet of the station governors, or at both.

Last spring the Commissioners arranged to introduce a carburetted water-gas plant; and arrangements were entered into with Messrs. Humphreys and Glasgow for two sets capable of producing 750,000 cubic feet of gas each. The contract included providing and fitting the whole of the producing plant from the generator to the condenser outlet, as well as the oil pumps and connections, separator tank, and turbine engines and blowers. The dimensions of the carburetted water-gas buildings are 56 feet by 40 feet, and 37 feet high. The engine and pump house, which measures 40 feet by 17 feet, contains two De Laval turbines with Sturtevant blowers, the former working at 18,000 revolutions per minute, and the latter at a speed ten times reduced; two duplex oil-pumps for the supply of oil to the carburettor; two pumps for furnishing water to the washers and scrubbers; two duplex pumps supplying water for condensing purposes; one tar-pump; and one duplex boiler-feed pump. Two 50,000 cubic feet exhausters have been put down to take the carburetted water gas from the holder and force it through the purifiers and station meter, where it is mixed with the coal gas in the proportions required. An existing set of purifiers, 30 feet by 20 feet, is used for the carburetted water gas, as well as the 50,000 cubic feet station meter. All the connections to the holder, purifiers, and station meter are so arranged as to be used for either water gas or coal gas by opening or closing the necessary valves.

The other contracts in connection with the installation included a hydraulic coke hoist, capable of lifting a full load of coke in waggons, together with the attendant, to a height of 30 feet; a Lancashire boiler 30 feet by 7 ft. 6 in., fitted with Wilton's patent forced draught arrangement and Sugden's steam superheater, working at a pressure of 120 lbs. per square inch; and an oil-tank, constructed of steel, 30 feet diameter by 12 feet deep, having a capacity of 52,000 gallons. It is stated that the experience with the plant (which was put to work in October) has corroborated the opinions which guided the Commissioners when they first arranged for it, by the ease of working, the economy it gives in the manipulation of the coal gas retorts over the week-end or when a sudden demand is made through dull weather, or for an increasing consumption, by taking up the extra load.

Within the past year or two, several improvements have been introduced also with regard to the manipulation of the coke. This is removed from the retort-house in side tipping waggons, drawn by small locomotives working on a two-foot gauge, which convey it to the gantry, where it is quenched with water and turned over. A travelling crane with a patent grab then lifts it and places it in the riddle hopper. There the coke is separated into breeze, rivetters' or smithy coke, and best riddled coke, and then falls into different tanks for removal as desired. The total length of the narrow-gauge railway in the works is 1320 yards.

Alterations have also been made in the sulphate of ammonia plant. A new saturator has been erected, from which the sulphate is raised by a Wilton patent discharger into boxes running on an overhead railway, and after draining is conveyed away for storage. A sulphate store capable of holding 250 tons has been built; and condensers have been put up in which all the residual gases are cooled before absorption. The whole of the sulphuretted hydrogen given off from the saturator is dealt with by two purifiers 30 feet square, controlled by a hydraulic change-valve whereby one purifier may be cleaned while the other is at work. A steam-jet injector, fixed at the inlet of the condensers, regulates the supply of air for the revivification in the purifiers of the hydrated oxide of iron.

There is in connection with the laboratory a small experimental gas plant, complete in every detail, in which samples of coal may be tested. The retort will take a 2½ cwt. charge every four hours; and a careful note is kept of the volume of gas, the illuminating power, and the quantity of tar, coke, and liquor, together with the impurities in the gas.

The area of supply is just over 17 square miles; and there are 147 miles of gas-mains. The services number 14,362; and on Oct. 31 last there were 43,087 consumers, and 5400 public and private street-lamps supplied. There are 2151 stoves in use, and 7958 prepayment meters.

Of the £8662 10s. of annuities (of a nominal value of £216,562), £2362 12s. (of a nominal value of £59,065) had been redeemed on April 30 last. This left a nominal value of £157,497, which added to the loans (less sinking fund payments) £219,197, makes the present debt £376,695.

In conclusion, it may be mentioned that the capital per million cubic feet of gas made stands at £559, and per ton of coal carbonized at £5 7s. 1d. Annuities, interest, and sinking fund per 1000 cubic feet of gas sold amount to 9s. 0·2d.; feu duties and rates and taxes, to 2·73d.; and total fixed charges, to 11·75d. The percentage of sinking fund to capital is 2·71. When the works were taken over, the capital stood at £1278 per million cubic feet of gas made.

Conversion of Calcium into Sodium Ferrocyanide.—The Administration des Mines de Bouxviller (according to their French patent, No. 339,996 of 1904) add sodium chloride to a hot, strong solution of calcium ferrocyanide, and the crystals of sodium ferrocyanide which form are salted out from the mother liquor of calcium chloride formed, or they may be crystallized from the concentrated liquor on cooling.

REDMAN'S NEW CARBONIZING SYSTEMS.

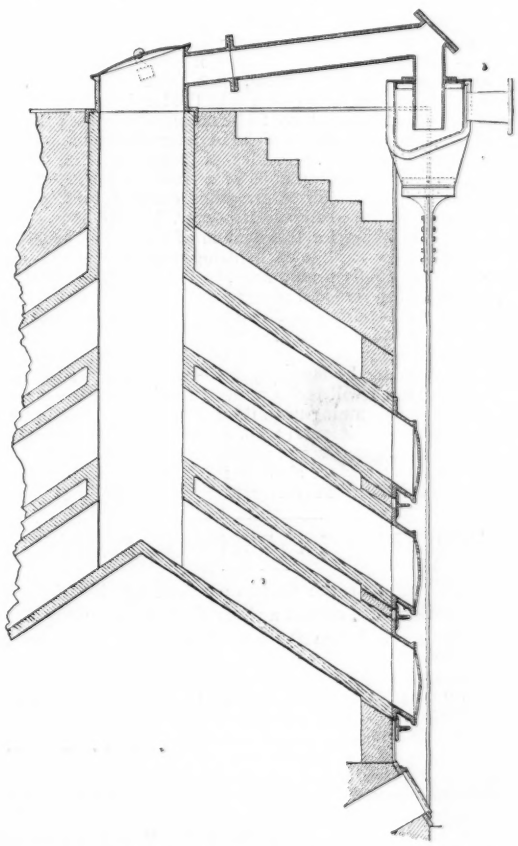
TIME was when the gas engineer and manager was rare in the professional ranks who was prepared to look at, except as a curiosity, anything that proposed a departure from the time-honoured methods which he, and perhaps his father before him, had followed in connection with "the science and practice of the manufacture of coal gas." But that is all changed now. New ideas and new things come along at such a comparatively rapid rate, and are found to have their economical uses, that the old-fashioned notion that there could be nothing better than the old and tried systems has been completely broken down. Little surprise is now created over anything exhibiting merit and novelty; and the gas engineer and manager is open to consider anything and everything that has in it the assurance of profit in the way of increased economy, though oftentimes application—chiefly through necessity—follows slowly the consideration.

Perhaps no field in gas manufacturing operations has received so much attention as that of the processes connected with the carbonization of coal; and there has been a large amount of work done between the old direct-fired retort-setting and the present-day horizontal setting with modern charging arrangements or the more stately-looking inclined retort-setting. But those inventive engineers who have been turning their attention to the question of carbonizing in vertical retorts appear to be convinced, though they have not quite reached their own ideal in all the arrangements incidental to practical working, that what is being done with horizontal retort methods and the inclined system is not by any means the last word on the subject. Those responsible for the birth of the Settle-Padfield system, and those who are so assiduously working at the system in Germany bearing the name of Dr. Bueb, say so. And if the best that has so far been done with the Settle-Padfield retort as known by the published results—which results we believe are in quantity nearly equalled by those being obtained in Berlin, though in quality are not (the statement runs) as high, but this, of course, may be open to explanation—if that best may be taken as the acme of carbonizing attainment at the present time, then Mr. Thos. Redman, of Bradford, comes along and tells us that this has not, he is perfectly satisfied, exhausted the possibilities of carbonization for the production of gas. He admires the ingenuity of the inventors of the Settle-Padfield system, gives them every credit for what they have accomplished, but questions whether that system, or, for the matter of that, any other of high claim that exists, now represents finality in carbonization. He has, as our "Correspondence" columns have lately shown, directed notice to what he conceives to be a drawback of the Settle-Padfield system—that is to say, that a very small amount of carbonizing surface for every 7 lbs. (say) of coal charged into the retort under the plunger method of working is utilized.

We are not going to discuss here Mr. Redman's contentions in this regard, as the principal object of this article is to draw attention to that gentleman's new patented systems, which have for their purpose the securing of a larger yield of gas from the carbonizing surface employed. But we are, in doing that, compelled to refer to the Settle-Padfield system, in order to present Mr. Redman's point. Just for argument's sake, he assumes that when a charge of 7 lbs. of coal is dropped into a Settle-Padfield retort—say, of 18 inches diameter—it makes a layer of $\frac{3}{4}$ inch in thickness; so that round the retort that layer is only monopolizing a ring of the carbonizing surface $\frac{3}{4}$ inch deep. Therefore, he maintains that in this method of charging what is being done is the gradual building up of a block of material in which there is a core of uncarbonized matter, or a core not so well carbonized as the coal towards the outer part of the cylindrical charge. Then, in order to get this core carbonized, it is necessary that there shall be a slowing down, which means a waste of time. And in addition to this there is no escape for the gas excepting through the core. We are making no admissions as to the accuracy of all this, but are advancing Mr. Redman's arguments in order to make his point, which is this: If by some means the 7 lbs. charge could be brought into direct contact with the carbonizing surface of a hot retort to an extent, ten, twenty, or perhaps thirty times as great as in the Settle-Padfield retort, then what would be the result in respect of the evolution of the gas? If this could be done, then Mr. Redman claims that the carbonization results of the Settle-Padfield system will be tremendously outstripped. What is to prevent it? That is the question that has been asked by Mr. Redman. His answer is that there is nothing to prevent it, seeing that he has already devised a system, patented it, and is now working out the practical details, which will, in his opinion, achieve higher points in working. But as the practical details have yet to be worked out, we can, of course, only submit the patented systems as Mr. Redman's proposals for securing a high carbonizing efficiency for any given amount of carbonizing area.

Let us take the first system. Here we have set four short lengths of double inclined retorts—two in parallel on each side of the bench; and therefore with two discharging mouthpieces on each side. Immediately above the junction of these four short inclined retorts, and running to the top of the bench, is a square shaft, at the top of which is the mouthpiece, with one ascension or take-off pipe running from it—the mouthpiece being surmounted by a revolving charging apparatus. At the junction of the four retorts (or Mr. Redman prefers to call them limbs), and rising from the floor, is a pyramid, having graduated sides, upon which the charge falls. Now the charge is not dropped into all four limbs at one time; but through the slow revolution of the charging arrangement a small charge will drop down each corner of the vertical shaft in succession, and by dropping on to the slightly curved side of the pyramid rising towards that corner will be directed and scattered on to the floor of that inclined limb. Therefore each limb will receive in rotation and intermittently its contribution of coal for carbonization until the charge is complete. In this way, by subjecting the small doses of charge to the larger carbonizing surface, Mr. Redman claims that there will be an increased make as compared with the Settle-Padfield system, and that the fluctuations in the evolution of the gas will be considerably minimized. It should be clearly understood that in this system no carbonization takes place in the vertical shaft, but entirely in the inclined limbs; and, at least as compared with the Settle-Padfield retort, it is claimed by the inventor that each fresh part of a charge is subjected to quite twenty times more carbonizing surface. To carbonize in a vertical retort he contends is thoroughly wrong in principle, in view of the limited amount of good carbonizing surface to which the charge is exposed.

The amount of coal which will be dropped in each limb of the carbonizing plant on each revolution of the mechanical charger has not yet been determined, nor have the dimensions or anything else been settled at present. These are all being determined by experimental work. When they have been arrived at definitely, then the present introductory article will be supplemented by another, by which time perhaps Mr. Redman will also be able to furnish us with some working or experimental results to corroborate the theories as to the capabilities of the system. But present calculations assure him of these points: That while the beds of retorts constructed on this plan will occupy much less space than the present inclined or the horizontal systems—in other words, on a given area the producing capacity of the system, Mr. Redman is satisfied, will greatly exceed anything that is being done at present. Less height of bench will be required by this plan of construction than for the inclined or vertical system, and consequently less height of house, and it follows a great saving of capital expenditure, which, of course, is not a negligible quantity in the quest for greater economies in gas manufacture.



THE SECOND SYSTEM OF CARBONIZATION REFERRED TO IN ARTICLE, SHOWING THE CENTRAL SHAFT FOR THE CHARGING-HOPPER.

Now in the second system, Mr. Redman proposes something somewhat similar in the method of constructing the plant; but it is on a more extensive scale, and the charging of the four retorts is completed in one operation. In this plan each pair of limbs may be equal to any length up to a 20-feet inclined retort, so that in one bed there might in the four limbs be 40 feet length

of carbonizing surface. In similar manner, there is the central shaft; and this is constructed of a capacity suitable for accommodating a charging hopper divided into four vertical compartments; the bottom of the hopper being fitted with doors, which are opened and closed by one top lever. This charging-hopper is run overhead on a single rail. When the four inclined retorts are emptied of their spent charges, the mouthpiece of the central shaft is opened, the four-chambered charging-hopper is lowered down the shaft, and, by releasing (by the aid of a lever) the doors at the bottom, the four retorts are simultaneously and immediately charged, each with the proper quantity of coal.

As in the other system, so in this, Mr. Redman sees several structural economies—such as in brickwork, bench-fittings, and charging arrangements, besides the benefits to be gained in working. The taking of the gas from the four retorts by one central shaft, from which one large ascension-pipe leads, is also pointed to as an obvious advantage. The top of the bench, both in this and the first system described, is stepped downwards from the central shaft; and a stage-floor is carried above for the operatives. In comparison with the mechanical method of working, it will be apparent that in this second system slightly more labour will be required; but against this Mr. Redman places what he has to offer in the way of structural savings, and the economy in carbonizing time and increase in production of gas that he is confident of realizing in comparison with ordinary inclined retort working. In this second system, too, he points out that the four limbs may be multiplied in vertical line; and the whole be charged simultaneously by one combination charging-hopper.

This last reference brings us to a combination arrangement for charging simultaneously three or more inclined retorts set in tiers on the ordinary system. In lieu of the ordinary mouthpieces at the upper end, under this new patented plan, Mr. Redman proposes to construct a shaft, into which a charging-hopper would be lowered, as in the last described central-shaft system. The hopper is divided vertically into as many compartments as there are retorts in the tier, and with transverse curved bottoms to each; so that the top compartment nearest the bench is utilized for charging the top retort, the rear one the bottom retort, and the intermediate ones the middle retorts in the tier. With this as in the former described system of retort-setting, one large storage hopper at any convenient point would suffice for filling the charging-hopper for any reasonable number of beds. With this method of charging, too, one ascension-pipe at the top of the shaft would suffice; and the mouthpieces would be greatly reduced, as no socket is needed for the ascension-pipes. Practical drawbacks will be seen in this system, such as the additional height that would be required for dealing with the long charging-hopper; and inclined retort-houses have to be constructed now of a height that alone has considerable weight in determining the system of carbonizing to be adopted. Besides this, what would be the effect of this large shaft at the top ends of 20-feet retorts on the heats is a question upon which information derived from practical working would be interesting. However, Mr. Redman has not himself the same liking for this system of retort and charging as he has for the two complete carbonizing methods first noticed.

This article is simply preliminary, to indicate the character of Mr. Redman's proposed and ingenious new systems of carbonization. Many points perhaps will occur to the reader upon which he sees practical difficulties. Details, however, of a much more conclusive character are required before anything definite can be said about the methods simply shadowed out here; and, above all, the gas engineer will feel a natural restraint in the matter of applauding or condemning until the inventor can produce the results anyway of experimental tests made on a working-scale setting. All these are matters to which Mr. Redman is now about to devote himself; and we shall be interested, and shall heartily welcome, the issue of his investigating work.

WELSBACH'S PYROPHORIC ALLOYS.

The publication of the German patent specification of the pyrophoric alloys discovered a short time since by Baron Auer von Welsbach, has drawn the attention of the Technical Press on the Continent to the immense possibilities which their discovery presents. Their importance has already been recognized in the "JOURNAL," where the specification of the English patent covering their production was reproduced almost in its entirety on June 28 last (p. 960). For the benefit of readers who may not then have realized the significance of the discovery to the gas industry, we propose now to recall attention to it.

It appears that the metals of the rare earths, when alloyed with iron or certain other metals, have the property of emitting, when rubbed, brilliant sparks. The sparks arise from the spontaneous ignition of the tiny particles of metal detached by the friction. The intensity of the ignition and the brilliancy of the luminous effect vary with the particular metals used in the production of the alloy, and with their proportion in it. The most intense effects are obtained when there is about 30 per cent. of iron in the alloy. Of the rare metals, lanthanum alloys with iron give the most brilliant of illuminating effects; cerium gives an alloy which is best adapted for igniting gaseous mixtures. It is, of course, for ignition purposes that the alloys are likely to possess the most direct interest for the gas engineer; and this use of them was not made so conspicuous in the English patent specification as it appears to have been on the Continent. The tiny particles dislodged by friction from the alloy burn with great rapidity, but without evolving heat which can be felt appreciably by the hand. Nevertheless, the sparks are capable of igniting (with certainty and almost instantaneously) combustible gases in admixture with air. The precise degree of friction required to produce the sparks is not clear. According to one account, the alloy must be slightly touched with a file; according to another, a light touch with a steel rod suffices. In any case, the friction required is small; and there seems no obstacle to the production of a device by which it will be automatically effected when a gas-tap is turned on. If this be so, and the alloys are, as stated, unaffected by atmospheric influences, we have the necessary conditions for the production of an ideal self-lighter for incandescent and other gas-burners. The requisite rare metals occur tolerably plentifully in certain minerals. Cerium, the most important for the manufacture of an ignition alloy, is the predominant constituent of monazite sand, which is now worked to an enormous extent, primarily for the extraction of the relatively small proportion of thorium salts which it contains. It would thus seem that there is now a prospect of a profitable use being found in connection with the gas industry for the redundant (from the mantle makers' standpoint) cerium of monazite sand.

THE WORLD'S RESOURCES IN THORIA.

In the course of a series of Cantor Lectures delivered at the Society of Arts by Mr. BENNETT H. BROUGH, the Secretary of the Iron and Steel Institute, he made the following remarks on the above subject.

Some of the rare earths have attained considerable industrial importance since the introduction of the system of incandescent gas lighting. The principal constituent of the mantles is thoria; and the chief source of this oxide is monazite—a mineral which occurs in Brazil, Norway, the Urals, Carolina, and Canada. Monazite is found in crystals, which are sometimes of considerable size, and in irregular masses; but the deposits which are of commercial value are the sands formed by the disintegration of rocks which originally contained monazite. The principal deposits of this occur in the United States and in Brazil. In the former country, the workable deposits of monazite sands are confined to Carolina, and cover an area of from 1600 to 2000 square miles. Their thickness varies from 1 foot to 2 feet, and the monazite present ranges from an infinitesimal proportion to 1 or 2 per cent. In Brazil, the deposits occur as beach sands which have been concentrated by the action of the waves. The sand is cleaned and concentrated by washing with water, and if magnetite be present, it is removed by a magnetic separator. A cleaned sand containing 65 to 70 per cent. of monazite is considered to be of good quality; but in South Carolina a richer product, containing 85 per cent., is obtained.

The production of monazite is very irregular, and at the present time the market easily absorbs the whole of the output. The highest price recorded was in 1887, when it reached 1s. per pound; but at present the price varies from 2d. to 4d. per pound for a proportion of thoria varying from 2 to 6 per cent. The production in the United States during the year 1901 was 748,736 lbs. (334 English tons), valued at £11,852, or £35 10s. per ton; and in Brazil it was 1643 tons, valued at £23,937.

Technological and Scientific Dictionary.—We have received Part VII. of this work, published by George Newnes, Limited, under the editorship of Messrs. G. F. Goodchild, B.A., and C. F. Tweney. It extends from "Maxilla" to "Naphthaquinones." The longest article is the one on "Musical Instruments;" but "Methane" and "Naphthalene" (especially the latter), are treated at fair length, as is also "Measurement of Temperature." Altogether, the subjects are well chosen, and adequately dealt with, in view of the size of the work.

Running-off and Cooling Pitch.—The Paris Gas Company have obtained a French patent (No. 344,485 of 1904) for apparatus to effect the above-named object. The molten pitch falls from a number of small openings in a tank into a similar number of small troughs situated side by side on the circumference of a wheel, which is rotated in a plane perpendicular to the line in which the orifices in the tank are disposed. This wheel is fixed near the top of a large tank filled with water to such a height that only the small troughs at the top of the wheel at any time are out of the water. Small jets of water are projected on to the pitch as it flows into the troughs—thus causing a sudden cooling. The troughs are normally bottomless, but temporary bottoms are provided for those at the top of the wheel, in the form of plates, which are pressed by springs against the under side of the troughs. The pieces of pitch in the troughs, thoroughly cooled by passing through the water, fall out of the troughs when they reach the lowest position of the wheel, and are received on an endless conveyor, which rotates in the tank, passed thence on to a convenient number of other rotating conveyors, and finally deposited in the buckets of an elevator, which removes them from the tank. A device for forcing the pieces of pitch out of the small troughs when necessary is described, and forms the subject of one of the claims.

YORKSHIRE JUNIOR GAS ASSOCIATION.

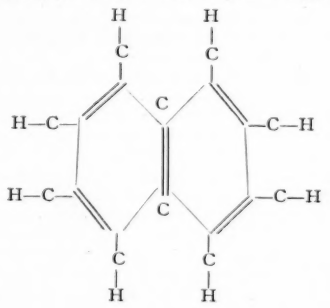
Meeting at Bradford—The Naphthalene Question.

Last Saturday afternoon, the members of this Association gathered in large numbers at the Municipal Technical College, Bradford, to debate the question of "Naphthalene." The PRESIDENT (Mr. W. Cranfield) was in the chair, and the debate was opened by Mr. J. H. Brearley, of Longwood, one of the honorary members of the Association. The Chairman introduced him as one of the most valued of their friends, whose assistance, counsel, and sympathy had been freely extended at all the stages in the development of the Association, and to whom they were greatly indebted.

Mr. BREARLEY opened the debate with the following remarks.

Naphthalene is a hydrocarbon closely associated with the benzol series, for in the process of carbonization it is probable that two atomic rings of benzol are united in such a manner that two carbon atoms of one ring do service for both rings according to the following equation :—

$$C_6H_6 + C_6H_6 - 2C - 4H = C_{10}H_8$$



In the molecule of a hydrocarbon, it is generally true that the less the number of carbon atoms and the greater the number of hydrogen atoms the more volatile it is. Thus marsh gas (CH_4) and ethane (C_2H_6) are gases; propane and butane (C_3H_8 and C_4H_{10}) are very volatile liquids; and so on. Benzol and its homologues, as you know, are volatile liquids, while naphthalene and anthracene are crystalline solids.

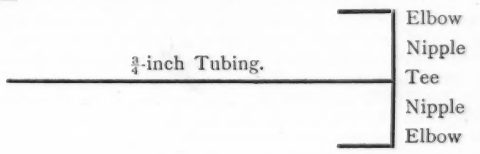
Naphthalene is fusible at 79·2° C. or 174·6° Fahr., and boils at 217° C. or 422·6° Fahr. without decomposition. It is not decomposed at a red heat; and not until the high temperature of its flame is reached is decomposition effected, and that only with the assistance of the oxygen of the air. The formation of naphthalene in the process of carbonization is pretty well understood. It is generally conceded that the introduction of high temperatures frequently, though not necessarily always, heralds the trouble of naphthalene deposits. This is due to so much naphthalene being produced in the crude gas that a portion of it often escapes being carried down in the liquid products of condensation, and this ultimately forms a solid, sometimes in the purifier connections, occasionally at the gasholder inlet or outlet pipes, but more frequently in the mains and services of the district. The same thing applies to the carbonization of gas oil in the manufacture of carburetted water gas. Troubles with naphthalene are much more likely to exist when the oil is split up at a high temperature as against a low one. The vapour tension of naphthalene, as you will be aware, is very high; and to this, together with the property of changing from the vaporous to the solid state without passing through the liquid condition, has been fittingly attributed the origin of naphthalene troubles.

Those seniors who have been troubled with naphthalene know too well the remedies they must apply to remove deposits. These, however, may not be too familiar to you; and the following extracts from communications which I received from other engineers may be of interest: "The principal points of stoppages are in our scrubbers and in the inlet and outlet of the gasholder on the works. An increase of pressure at the affected point indicates coming trouble. When the stoppage is in the scrubbers, there is nothing for it but shutting off the affected scrubber and taking out and scraping every board. Our first scrubber has been cleaned out twice in four years, and the second once; and each cleaning has yielded quite a cartload of naphthalene. When a stoppage occurs in the inlet or the outlet of the gasholder, we adopt a system called 'plunging,' which is as follows: The flange is taken off the inlet or outlet pipe, and the latter is then filled with water. To a long pole sacks are fastened at one end, so that it will just fit the pipe, and to the other end of the pole half-a-dozen ropes are fastened. The end with the sacks is inserted in the pipe, and a man takes hold of each of the six ropes at the other end, which, of course, is in the air. They pull, and the pole is forced down the pipe, pushing the water forward into the holder—the naphthalene being carried with it. This repeated two or three times clears the pipe."

The influence of atmospheric changes, so ably dealt with by Mr. William Young in his paper presented to the Gas Institute in 1900, is technically illustrated by particulars which I get from the same engineer. The service to a fishmonger's shop passed through his cold storage cellar, with the result that every few days the service beyond was completely blocked with naphthalene. Ultimately a larger service was put in, and the trouble apparently ended.

It is pretty well known that before naphthalene troubles are experienced, the gas must come in contact with cold surfaces, scrubbers, exposed washers, open purifiers, and the like. In a neighbouring district to ours, the only place where naphthalene trouble is experienced is at a point about a mile beyond a length of main that crosses a stream. The sudden cooling at this point brings down the naphthalene; and this is carried in the stream of gas to the point where obstruction is most easily set up.

At another works the most acute point of the trouble was the inlet of the largest gasholder. The remedy applied here was to fill up the syphon with very hot water. Then two lengths of ¾-inch piping were screwed together, with a T-piece at one end, and each branch connected with a barrel nipple and elbow, thus:—



Round this sacks were wrapped to fit tightly the 9-inch pipe; and the result was pretty much the same as in the first instance referred to—viz., that the naphthalene which was not forced into the holder was subsequently pumped from the syphon. One engineer in the South attempted to clear naphthalene from his gasholder connections with the aid of steam. The only obvious result was that he knew more about naphthalene after than he did before he attempted this remedy. The naphthalene was converted into a solid mass instead of flocculent crystals, and was ultimately removed with iron bars. The use of crude naphtha is largely resorted to for clearing services or mains where the force-pump is impotent.

Of course, the methods of clearing naphthalene referred to are, figuratively speaking, as old as the hills in districts where troubles of this nature are pretty frequent. But the West Riding is not one of them; and it occurred to me that they would not be devoid of interest to juniors who may some day be faced for the first time with a stoppage through deposition. Moreover, information as to this class of remedial measures does not receive that frequent publication that is accorded to what may perhaps be described as remedies of the preventive class.

You have probably assimilated such knowledge as is at present available as to what goes on when coal is distilled. Much of that which takes place in the retort rests upon the basis, often slender, of hypothesis. We are pretty sure, however, that synthesis and decomposition proceed side by side; and it has been proved that the carbonizing heat is an important factor in the quantity of benzol and naphthalene produced. Generally speaking, with low heats the yield of benzol is high and that of naphthalene low; high heats have the reverse effect. While these increase the quantity of naphthalene diffused in the gas, troubles from naphthalene by no means follow as a natural sequence. If it were so, external curative agencies would be required at all works where high heats are the rule. Some works are, however, entirely free from trouble, even though working with high carbonizing temperatures. The time will probably come when discussion will not be most acute as to which particular solvent is best with which to wash the gas when introduced externally, but which process of manufacture (bearing in mind economical production) will ensure freedom from naphthalene troubles, and render superfluous, solvents introduced externally. This is no new idea. Many engineers still hold that the secret of lasting success lies in the method of condensation. My sympathies are with this view, as it seems to accord with my own experience.

It is no doubt paradoxical to speak of experience when, as a matter of fact, during sixteen years spent in the gas industry, I have never had experience of naphthalene in its "Mafficking" moods. These years have been about equally divided between two works; and during the whole of the time not a crystal too many has been formed, either on the works or in the mains and services. Such an experience places one, with respect to naphthalene, in a similar position to that occupied by a certain eminent journalist with respect to the theatre which he recently visited for the first time at the age of 54. If my experience of naphthalene rampant is similarly deferred, I shall have due cause for self-congratulation. The journalist is now giving his impressions of the theatre; and it is held that he will be able to criticize and describe impartially what he sees, since his mind is unbiassed by previous association. This argument applies with equal force to our subject-matter. There can be little doubt that association with sectionized research for naphthalene remedies, particularly if it meets with some measure of success in its early stages, impairs the perspective with which other forms of research are viewed. One need not go into ancient history for illustrations of this.

While dealing more particularly with naphthalene as affected by observations and results at Longwood, experiments and tests which I intended to bring before you are in an incomplete stage, and therefore not ready for publication to-day. The scope of my

remarks, consequently, is much more limited than I had originally intended. Six years ago regenerative furnaces were introduced; the furnaces previously employed being of the generator type. Higher heats were obtained; and we have tried to realize the ideal set up by Mr. Charles Hunt, that "the best heat for ordinary working is the lowest that will thoroughly carbonize in the allotted time; the stopped pipes with high heats causing loss beyond the gain by the higher temperatures." Incidentally it may be remarked that we have no stopped pipes. The deposit which forms at the bottom of the ascension-pipes is cleared at each charging by the stoker's auger; and this is the only deposit that needs attention. Directly after the regenerative furnaces were introduced, the distiller of our tar pointed out that there was a marked variation in its composition. The quantity of light oils was considerably less, while that of naphthalene was nearly doubled. In short, the naphthalene was present in the tar in greater proportion than in any other of about twenty tars distilled. This set the writer thinking. If the tar from the Longwood works contained more naphthalene than any other, then obviously we dissolved out more from the gas; and as we were never troubled with naphthalene deposits, it indicated at least the desirability of research. Tests properly carried out on works entirely free from naphthalene troubles ought to throw quite as much light on the solution of this problem as others conducted at works where troubles are experienced.

Incidentally a reference to the carbonizing results may appropriately be made here. The coal employed consists of gas nuts, unscreened coal, and gas slack, in the proportions 3, 5, and 2. Working over twelve months with these proportions gave an average yield of 10,053 cubic feet. The retorts are 9 feet long, and 21 in. by 15 in. diameter; and they are hand charged. It will at once be seen, therefore, that fairly high heats are the rule. With screened coal we should expect to get a yield of upwards of 11,000 cubic feet, against the yield with the class of coal now used. A recent analysis of tar from the Longwood works, based on the distillation of 12 tons (working scale), was as follows:—

Products Per Ton of Coal Carbonized.

	Cwt.	Qrs.	Lbs.
8 galls. of 5° Twaddel ammoniacal liquor (2 p. ct.)	0	3	0
5 ,, crude naphtha	0	1	14
8 ,, light oils	0	3	12
80 ,, creosote	7	2	0
Pitch	10	2	0
Total	20	0	0

The 8 gallons of light oils yielded: $\frac{1}{2}$ gallon of 90's benzol, 2 gallons of 50's benzol, 1 gallon of carbolic acid, and $4\frac{1}{2}$ gallons of creosote. The $84\frac{1}{2}$ gallons of creosote, on further distillation, gave 5 cwt. 2 qrs. of naphthalene pressed. Longwood tar yields far more naphthalene in winter than summer; the quantity per ton in the hot summer months averaging 3 cwt., against $5\frac{1}{2}$ cwt. in winter. It is apparent, therefore, that to some extent, at any rate, naphthalene remains permanently in the gas in the summer, though small portions may be arrested by the purifiers.

This all goes to show how important is the influence of condensation, and herein appears to lie the only lasting solution of the problem. The condensers at Longwood are atmospheric, and of the annular type. They are four in number, and each is 29 feet high; the inner tube being 2 ft. 9 in., and the outer tube 4 feet in diameter. The maximum day's make is 480,000, and the minimum day's 144,000 cubic feet, or 20,000 and 6000 cubic feet per hour respectively. The gas passes through the condensers in 7·68 minutes in summer and 2·30 minutes in winter. There is a condensing surface of 2460 square feet; but preceding the condensers is a foul main 212 feet long and 12 inches in diameter. The total condensing area—that is, condensers and foul main combined—is 3126 square feet, which is equal to 156 square feet per 1000 cubic feet on the hourly winter's make, and 521 square feet on the hourly make in the summer. There are no less than seven right-angle bends in the foul main before it reaches the condensers. In winter the gas passes through it at the rate of 7 feet per second, and in summer at a speed of 2 ft. 2 in. per second. It is obvious, with these speeds, that the bends will act as baffles; and at each turn of the pipe an eddying motion will be set up that will throw many of the tarry globules together, and bring them down—performing, in a lesser degree, the work of a tar-extractor. At 69 feet from the inlet to the condensers, the foul main is deflected upwards from the horizontal to the vertical; and at this point a tar take-off is fixed.

The consideration of the problem of why we are not troubled with naphthalene deposits does not appear to be made any simpler by a perusal of the figures showing the growth in the quantity of gas made during the last few years with identically the same condensing, scrubbing, and purifying plant. Here are the returns of the make of gas per annum and the maximum quantity made in one day for the years 1895 to 1903 inclusive:

Year.	Gas Made. Cubic Feet.	Maximum Day's Make. Cubic Feet.
1895	44,944,100	253,000
1896	47,043,800	251,300
1897	50,089,600	264,800
1898	56,290,100	268,200
1899	63,576,800	394,000
1900	66,238,200	339,900
1901	80,091,900	466,500
1902	89,060,600	462,900
1903	94,502,200	479,800

It will thus be seen that the relation between the lowest and the highest maximum day's make in this table is as 100 to 191, or practically a doubling of the duty imposed on the same plant.

About three years ago we changed from a type of anti-dip, which was far from satisfactory, to a liquor seal with a separate regulating-box to each bed. At the same time we made an alteration in the tar take-off arrangements. Hitherto all the tar had travelled with the gas in the foul main for a distance of 143 feet, at which point, as already stated, a tar take-off is fixed. The alteration we made was to remove direct from the hydraulic main the tar produced by one-half the beds, leaving that made by the other half to travel with the gas as before. This is mentioned because under both arrangements we have had complete immunity from naphthalene troubles. This applies also to benzol enrichment, which, after being at work for something like five years, was discarded about two years ago.

One of the most important points arrived at by two American investigators—Messrs. White and Ball—is that the purifier may exert a very important influence as a balance-wheel in controlling irregularities of naphthalene passing forward from the scrubbing plant. They proved that the purifiers will store up a very considerable quantity of naphthalene, and subsequently slowly give it back to a gas low in this constituent; receiving more in turn from a richer gas. They made numerous tests to support this, and coincidently it may be mentioned with purifiers the same size as those now in use at Longwood.

So far as these remarks and particulars apply to Longwood, they are given not so much for the actual information they contain as for the ideas they suggest. For us, at all events, it has mapped out a course which will be pursued somewhat on the following lines: (1) To test in varying seasons the finished gas for grains of naphthalene and for the vapours of absorbent liquids. (2) To test the gas after passing the scrubbing plant—viz., at the inlet of the purifiers—for grains of naphthalene. (3) To test it also at the inlet of the scrubbing plant. (4) To observe by tests the proportions of solvents—that is, oils distilling over at from about 130° C. to 215° C.—and naphthalene in the tar as it runs off from various points between the hydraulic main and the outlet of the condensers. (5) To test the crude gas at similar points for (*a*) vapours of solvent liquids and (*b*) naphthalene. Other tests may follow; but this is a fair list to be going on with. I had hoped to reach this stage before appearing before you; but it has been impossible to get through with them.

In carrying out the tests, we shall be faced with the difficulty that a reliable method has not yet been evolved for testing for naphthalene crude gas laden with tar fog. The apparatus devised by Messrs. Colman and Smith produces satisfactory results with crude gas after the tarry particles have been removed; but it will not be satisfactory for testing gas previous to condensation The minute globules of tar held in suspension will contain a proportion of naphthalene which has passed from the gaseous condition; and whether a method can be evolved for separating these without disturbing the normal composition of the gas at the point of test, remains to be seen. The American investigators previously referred to devised a method of arriving at the amount of mechanically suspended tar, the quantity of naphthalene in it, and the proportion present as vapour in the gas. Their methods are fully described in the "JOURNAL OF GAS LIGHTING" for Oct. 25 and Nov. 1 last (pp. 252, 323); but, speaking without having put them to practical application, they seem to admit very largely the liability of personal error. This would preclude any but chemists of long practical training and skill from arriving at even approximately reliable results. If an apparatus can be devised which will admit of the separation of the tarry globules from the gas without causing the latter to pass through the separated tar, fairly correct results may be arrived at. How separation is to be effected, however, without altering the composition of the gas (*minus* the tar fog), and without causing the gas to pass through the tar which is being separated, is something which I fear will not be attained. Owing to the variation in the charges, the condition of the coal used, &c., a large number of tests will be required before reasonable deductions can be made therefrom.

Since writing the foregoing, I have been able to peruse the report which the Naphthalene Sub-Committee have just presented to the Southern District Association. I am glad to find that the work of that Committee is proceeding very much on the lines which my own reflections lead me to conclude are the correct ones. The Committee say in their report that they believe it is possible, by submitting the gas to treatment in a condenser designed to embody certain principles indicated by the investigation so far as it has gone, to eliminate naphthalene to such an extent as to prevent further trouble from it. When it is considered that so many works, like our own, are not troubled with naphthalene year in year out, even though, as a vapour, it issues from the retort in large quantities, this certainly appears to be the most rational method of facing the problem, since, to quote from the Southern District Association report, it would be "automatic and inexpensive."

Mr. P. PARRISH (Dewsbury) spoke of his practical experiences in the South of England, where one portion of a works main was completely filled with naphthalene. He fitted into the foul main a rectangular box with baffle-plates in it, in order that the increased friction might induce deposition of naphthalene; extended the condensing area, which was greatly deficient; and rearranged the horizontal pipe condensers so that their tar should flow in the

contrary direction to the gas. So far these modifications had been highly successful. He should be glad to know Mr. Brearley's experience of the standard test—whether he found the amount of naphthalene indicated by weighing the precipitated naphthalene picrate and that obtained by titrating the picric acid to agree with each other. Personally he did not find them satisfactorily near together. He wished to be informed as to what statistics existed regarding the vapour pressure of naphthalene; his experiments led him to think that gases could be super-saturated with it, as he often found it present in greater excess than theoretically it should be in the gases at the given temperatures.

Mr. J. F. SMITH (Halifax), in answering the last speaker, said that a state something akin to super-saturation undoubtedly existed; but while the maximum amount of naphthalene that could be held as a vapour in any gas was definite for any given temperature, some could also be retained mechanically. Sudden cooling would produce condensation; but the deposition of the separated particles would start slowly. As regarded the inquiry about the agreement of the amount of naphthalene picrate weighed with the result of titrating the picric acid, he could emphatically say that they would agree if certain details were observed, and the publishcd instructions carried out to the letter. In the work upon the development of this test in which he had been engaged in conjunction with Dr. Colman, the reliability of the method had been repeatedly proved. The all-important precautions were: Frequent shaking during the first hour of cooling, so as to bring down all naphthalene from the sides of the vacuum bottle, and the avoidance of any excess of liquid in washing out the bottles. He should be glad to know how far apart Mr. Parrish's estimations were in the two methods mentioned.

Mr. PARRISH said 1·5 per cent.

Mr. SMITH congratulated Mr. Parrish on his success, and assured him that such a result was more exact than would usually be found, inasmuch as the authors of the test only claimed accuracy to within 1 in 30—*i.e.*, $3\frac{1}{3}$ per cent. He thought Mr. Brearley was taking too limited or else too rosy a view when he spoke of the West Riding's freedom from naphthalene trouble. He knew of at least two reports on the subject dated in the early sixties. The references to it in the classic writings of the Rev. W. R. Bowditch, Vicar of St. Andrew's, Wakefield, suggested it was an old enemy in that town. When he first entered gas-works eighteen years ago, in Sheffield, they were troubled with it, and the engineer of one works near Mr. Brearley's frankly owned to being plagued with it, and deemed himself almost the only honest engineer for being so candid. Mr. Brearley's introduction might lead his listeners to an erroneously limited conception of the origin of naphthalene, for it could be produced in the decomposition of benzene by heat—

$$\underset{\text{Benzene.}}{2C_6H_6} = C + \underset{\text{Methane.}}{CH_4} + \underset{\text{Naphthalene.}}{C_{10}H_8}$$

This view was supported by the known production of scurf, and of methane at high carbonization heats, when naphthalene also was formed. Bertholet and Hanschütz had also produced it from toluene and from acetylene—

$$\underset{\text{Toluene.}}{4C_7H_8} = 3C_6H_6 + C_{10}H_8 + 3H_2$$

$$\underset{\text{Acetylene.}}{5C_2H_2} = C_{10}H_8 + H_2$$

Probably much was also produced from the benzene homologues; the following equation being similar to that which Kraemer found on investigating the Dinsmore process—

$$4C_6H_6 + 2C_7H_8 + \underset{\text{Xylene.}}{2C_8H_{10}} + \underset{\substack{\text{Coal-Tar}\\ \text{Cumene.}}}{2C_9H_{12}}$$

$$= \underset{\substack{\text{Napthalene}\\ \text{hydride.}}}{2(C_5H_5)_2} + 3C_{10}H_8 + \underset{\substack{\text{Anthra-}\\ \text{cene.}}}{C_{14}H_{10}} + 2CH_4 + 2C_2H_2 + 9H_2 + C_2$$

Naphthalene also reacted with acetylene, yielding anthracene, for the gas-works production of which this supplied one theory—

$$C_{10}H_8 + 2C_2H_2 = C_{14}H_{10}$$

He agreed with Mr. Brearley's remarks on the economical temperature of carbonization; but some of them were unable to observe it to any considerable degree, because of the class of coal used, out of which they must get the gas. The economical temperature was not always that of the maximum make, but of the maximum candle power per ton. This latter would often involve a richer gas than they were instructed to supply; so the heat of the retorts was raised, and more gas was made of a lower grade. In this case they were not getting the best out of the coal, nor were they aiming at it. There was a difference in coals in regard to economical temperature. In the remarks made by Mr. Charles Hunt which had been quoted, he estimated that this temperature would generally be about 1650° Fahr., as measured by a Siemens water pyrometer, but stated that he did not mean that the coal should necessarily be distilled at that temperature. Another factor entering into the case was the different sizes of coal. Professor Mills, of Glasgow, had shown that, with coal in pieces 3·75 millimetres wide, he got 9437 cubic feet of gas per ton; but that with the same coal carbonized under identical conditions, but with pieces 0·375 mm. wide, he only got 3280 cubic feet per ton, and even this quantity came off but slowly. As one must charge and draw at definite intervals, something had to be sacrificed of theoretical considerations. With a fairly large coal, one could perhaps maintain the economical temperature; but at that same temperature the time would be too short for slack, so a higher one then became necessary. When a charge of such small coal was drawn, a core of black coal was generally found in the centre, somewhat nearer the bottom than the top of the layer. Carbonization thus proceeded from the outside towards the centre; and more by radiant heat from the top and sides than by transmitted heat from the floor of the retort. The gas from the central parts thus had to pass through incandescent fuel, and its benzol became decomposed. Thus one found more naphthalene resulting from the carbonization of small than of large coal. [Mr. Smith then dealt with the estimation of naphthalene in hot gas, and sketched on the blackboard an adaptation of the usual test apparatus, which he said should be able to yield the desired result.] He questioned the need of knowing how much naphthalene existed in the gas and tar separately, as would be evident, he thought, from the consideration of the physical chemistry involved. Condensation was not simply cooling the gas to a given temperature, but should be a scientifically conducted process for also retaining as many of the illuminants as possible, and selectively removing some other hydrocarbons. People were inclined to regard it too simply. It should be looked at from two aspects—first as a process of fractional condensation, and secondly as saturating a gas with a hydrocarbon vapour (*i.e.*, naphthalene). Many of the vapour tensions concerned had not been fully determined; but one could still discuss them by general formulæ. Vapour pressure multiplied by density equalled the weight of a vaporized substance in a gas. Now, with two non-miscible substances, which would not dissolve one another, of vapour pressures p and p^1 and densities d and d^1, these existed together in a gas in the proportion of $p\,d : p^1\,d^1$. Regnault investigated this with naphthalene and water (among other substances). Incidentally, he might say the question of the condensation of water vapour had something at least to do with naphthalene deposits, in spite of recent statements to the contrary. In the case of coal gas and naphthalene, however, they were dealing with vaporized substances which did mix and dissolved each other; and the vapour tension of a vapour was lowered by the introduction of a solvent. For example, pitch could take out benzol, as would also naphthalene, and reduce its vapour tension; and in coke-ovens, heavy oil was used to extract benzol from the gas produced. A striking instance of the action of solvents in reducing vapour tension was the case of formic acid and water, where the total vapour tension was less than that of either of the substances separately. In the case of miscible liquids, the rule previously quoted needed the insertion of a new factor—a constant (K), to be determined by experiment, for each new combination of substances which should represent this new condition in the case, so that one could state the rule that the vapours present were as $KP : KP^1$. Now, in the gas-retort all the volatile substances were in the form of vapour (say at temperature t) and eventually were cooled to temperature t^1; so introducing still another factor—the molecular percentage.

Vapours present at t = K in per cent. P : K in per cent. P^1
" " t^1 = K " P : K " P^1

Subtracting $t - t^1$ = K in per cent. P : K in per cent. P^1.

This was the part thrown down as tar. Too often our methods of condensation succeeded in removing illuminants and also valuable solvents. Bowditch long ago saw that the lighter hydrocarbons would go forward with the gas, if the heavy tar was quickly removed from contact with the gas. This reduced the constant K to a negligible quantity as regards the solvent action of the heavy hydrocarbons, and enabled the light oils—the naphthalene solvents—to go forward. This was the aim of Dr. Colman's cyclone arrangements and of Mr. Everett's (of Ilkley) screens for tar-fog. Finally, coming to the second phase of condensation (as previously mentioned), it might often be found that the gas at the condenser outlet had very little naphthalene—say, 4 grains per 100 cubic feet—and yet considerable trouble might exist from stoppages, because this clean gas proceeded along mains with heavy deposits in them, from which naphthalene would be taken up by the gas—*i.e.*, it would exert its vapour pressure pure and simple.

Mr. W. N. BOOTH (Halifax) thought that Mr. Brearley must not too readily accept the tar-distiller's statement that his tar contained $5\frac{1}{2}$ cwt. of naphthalene per ton in the summer, as against 3 cwt. in the winter, or, at least, he must not conclude that the $2\frac{1}{2}$ cwt. difference remained permanently in the gas in summer. The following figures seemed to reduce that suppostion to an absurdity. At 68° Fahr., gas was saturated with 27 grains per 100 cubic feet; and at 35° Fahr. it was saturated with 5 grains per 100 cubic feet. Now, 20 tons of coal gave, roughly, 1 ton of tar—

i.e., 200,000 cubic feet of gas were produced to every ton of tar.
$2\frac{1}{2}$ cwts. = 1,960,000 grains.
i.e., 1,960,000 grs. naphthalene carried by 200,000 cubic feet, or
980 grains per 100 cubic feet,

which was 36 times as much as would saturate it at 68° Fahr.

Mr. J. BOTTOMLEY (Milnrow) thanked Mr. Brearley for his descriptions of practical methods. It was valuable to know how naphthalene was produced, but valuable likewise to know how to remove it. Personally, he had no naphthalene trouble, though his tar was rich in it. He had seen many instances which clearly

indicated the powerful influence of sudden changes of temperature. At one seaside town, where strong cool winds often prevailed along with strong direct sunshine, he had frequently found one side of a street with nearly every service-pipe blocked, while no such trouble occurred on the other and sunny side.

Mr. J. H. HILL (York) owned to being troubled all the year round at both the York works, especially in winter. The tar from one works was exceptionally rich in naphthalene, more so than the other, where, however, they eventually found their condensers nearly blocked up. They had tried the Sheffield plan of condensing only to a fairly high temperature, but with similar apparent lack of success.

The PRESIDENT, in speaking briefly to close the discussion, said that, after the carrying out of the comprehensive scheme of tests outlined in Mr. Brearley's remarks, he knew he should be able to rely on even a still more enthusiastic and convinced support from that gentleman of the scheme outlined in his Presidential Address. Such tests were just the kind of work that few of the younger men had the opportunity of learning to perform, but which were absolutely necessary in any really scientific attempt to deal with the problems arising from naphthalene. The more discussions he heard and read on the present question, the more firmly was he convinced that very much of the past and present muddle arose from incomplete observation and non-comparable conditions. This vitiated many of the statistics offered, and readily explained why a process successful in one place seemed a failure at others. One heard of success attending (say) a temperature higher than usual at the condenser outlet; and it was promptly used at other works—probably oblivious of how far other unmentioned conditions were vital and perhaps predominant factors in the situation. This led to another consideration. They urgently needed not only the severe application of the principles of pure chemistry and physics to their gas problems, but also of logic, which really was systematized common sense. One of the commonest pitfalls was the confusing of the *post hoc* with the *propter hoc*. Because A followed B, it was not necessarily due to and consequent on B. This was a platitude, and should need no labouring; but it cropped up abundantly, and he had come across several naphthalene devices—not to mention those in other departments of gas practice—which were quack remedies of the *post hoc* type, whose full bearing and explanation had not been thought out. No noteworthy progress ever followed such practice, and but seldom would temporary and individual relief follow from it.

Mr. BREARLEY, in replying, expressed his pleasure at the vigorous and pointed discussion that his remarks had led up to, and said he felt that the sense of obligation was mutual. He had hoped to provoke a discussion that would enable him to go home knowing more of naphthalene than when he came; and he was satisfied with his success in this direction. He only accepted honorary membership of the Association on the understanding that he was to do something for the members. Replying to an inquiry put by Mr. Whitaker (of Wakefield), he said that the temperature at his condenser outlet was about 50° Fahr. in winter and 70° Fahr. in summer, and ranged between the two. He had not found any pressing necessity to regulate it in any other way or to any further extent. In the main, he must adhere to his reference to West Riding freedom from naphthalene, and ventured to say that an inquiry among the members present would largely support his contention. Anyhow, the contrast with what existed in the South of England was very striking. He highly appreciated Mr. Everett's tar-separator, and thought the results obtained very striking, and its promise bright. Even if naphthalene began to appear in larger quantities in the tar, &c., on the introduction of higher heats, without causing immediate trouble in the district, he thought Mr. Smith over-estimated the length of time that might elapse between cause and effect. He did not believe his successor would in that way have to suffer from his predecessor. He thought the statement as to the "sins of the Seniors being visited upon the Juniors to the third and the fourth generation," was much overdrawn. As regarded the apparent absurdity of the naphthalene proportions in his summer and winter tar, he should now think the explanation to be that the distiller had failed to account for all the naphthalene in the thinner creosote oil of summer time. He would remind them that the Juniors had more time for practical laboratory investigations than the Seniors, who would gladly encourage them in any research work which did not unduly interfere with their routine duties. In Yorkshire, out of 95 works, 74 made less than 100 million cubic feet per year; therefore few could keep a trained chemist, even if the supply of such gentlemen would be sufficient to meet a greater demand. He expected that before 25 years had elapsed, practically every works of a greater annual make than 50 million cubic feet would have its own chemist.

In proposing a vote of thanks to Mr. Brearley, which was afterwards carried enthusiastically, Mr. E. SUTCLIFFE (Birkshall, Bradford) spoke of Bradford's immunity from naphthalene trouble except for one year (1893), when, owing to the great coal strike, their ordinary Yorkshire coals had to be replaced by Durham coals. The seconder, Mr. E. BENN (Heckmondwike), spoke of the rare occurrence of trouble in his district. When it did occur, it was at old cottages, in the service-pipe, which had to be carried some feet up the outside walls.

SCOTTISH JUNIOR GAS ASSOCIATION.

Meetings of the Eastern and Western Districts.

Useful gatherings were held last Saturday by both of the Districts of the above-named Association. The Juniors are exhibiting great vigour in the prosecution of their work. Hitherto they have not required to call in the services of any distinguished outsider to address them. They have sufficient talent among themselves for the programmes they have drawn up for the present session. In the Western District this is exemplified by the readiness with which Mr. S. B. Langlands came forward to take the place of Mr. A. Dow, who has obtained a situation in Kirkcaldy, and who has consequently gone out of the district. Mr. T. Orr, of Motherwell, chose a wide subject in "The Relation of the Gas Industry to its Consumers"—so wide, indeed, that he did not give his views upon every item where the relationship exists; and a subdued grumble was heard upon that point. There are two answers to this grumble—that the subject was too large for a single paper, and that any matters which were not dealt with are open to anyone else to take up at another time. In this connection, it may not be amiss to recall the advice given by Mr. Alex. Wilson, of Glasgow, when the Association was founded—to make papers short, and to confine them to one point. The temptation is great, of course, to cover the whole field; but the effect is to rather scatter the thoughts which come out in the discussion. Credit must, however, be given to Mr. Orr for having put forward his views with clearness, and for having opened the way for a most interesting discussion. His paper was well and appreciably talked to, which should be to him the greatest satisfaction he could have. The paper by Mr. Langlands was of the nature of a running comment upon what he saw at the Earl's Court Exhibition. It did not lend itself to discussion, because those of the members who had visited the exhibition probably did not see the things which Mr. Langlands ferreted out; and those who did not visit it could have nothing to say. It was a pleasant production, however, and gave an opportunity for the author to hang on different items his views upon the trend of events in the gas industry.

The visit of the Eastern District to the chemical works of Messrs. James Ross and Co., at Falkirk, was interesting in more ways than one. In such a place there is, of necessity, much that could only be shown to outsiders who are men of honour. The firm placed themselves in the frankest manner in the hands of the District, the members of which must have seen much that will be of value to them, and carried away a great deal that will be of benefit to them in after life. The members were highly privileged in being allowed to see the works—being, in fact, the first body of the kind who have been admitted within the walls. Visits to such works, when intelligently carried out, are of as much, if not more, value than the reading of papers; and it may safely be surmised that to those who were present the visit will always have a kindly place in their recollections.

Western District.

The meeting of the Western District was held in the Technical College, Bath Street, Glasgow, and there was an attendance of about seventy. Mr. James Lowe, of Glasgow, the President, occupied the chair; and opened the proceedings by intimating that Mr J. Barker, now of Nairn, would be unable to give his paper on "Structural Steel Work" at the meeting on the 14th of January, and therefore the Council would be glad to have the offer of a communication to fill the vacancy. They would also be pleased to have offers of papers for next session. Mr. T. Orr, of Motherwell, then read his paper on "The Relation of the Gas Industry to its Consumers;" and Mr. S. B. Langlands gave an account of his visit to the Earl's Court Exhibition. These contributions to the proceedings, with a report of the remarks to which they gave rise, will be further referred to next week.

Eastern District.

The members of this District, to the number of thirty, paid a visit to the Lime Wharf Chemical Works of Messrs. James Ross and Co., at Falkirk. On arriving at 2 p.m., they were joined by Mr. W. M'Crae, the Engineer and Manager of the gas-works, an honorary member of the Association. The party drove to the works, where they were received by Mr. Orr, jun., Mr. Ross (Chemist), and Mr. Wilkie (Cashier). By these gentlemen they were cordially welcomed, and were conducted round the works; being shown the various processes in operation. Thereafter the firm entertained their visitors at tea. At the close of the repast, the President (Mr. A. Masterton, of Edinburgh) said that with much pleasure and gratification it had fallen to his lot to convey to Messrs. James Ross and Co. the thanks and indebtedness of the members. He had long known the firm, through business relations, and had always held them in the highest estimation as one in the foremost ranks of the chemical trade. The visit to these interesting works which they had been privileged to make had been not only instructive but very fascinating. The members had not only been supplied with mental food, but had had their bodily wants attended to most hospitably; and they felt very deeply indebted to all the contributors to their afternoon's

enjoyment. He would specially thank Mr. Orr, jun., Mr. Ross, and Mr. Wilkie, for conducting the party over the works, and explaining so lucidly and comprehensively the technicalities of the various processes, and the working of the plant. They had enlightened the members on many points which hitherto they had only known "through a glass darkly," but which had now been made clear by actual demonstration and explanation. They appreciated highly the valuable information so frankly given to them, and felt certain that they would go away, if not better, certainly wiser, men. In a word, they had had brought before them, in a practical way, the wonders inherent in coal tar—a product which was lightly esteemed in gas-works about fifty years ago, but which had been raised to its present importance by chemical research, and had been made, by processes of distillation, to supply so many wants, and to fulfil so many useful purposes. He asked the members to give heartily a vote of thanks to the firm of Messrs. James Ross and Co., one of the earliest pioneers in this interesting industry. They hoped the firm might long continue to prosper, and that their success might be more unprecedented in the future than it had been in the past. In like manner, they accorded to Mr. Orr, Mr. Ross, and Mr. Wilkie their best wishes and heartiest thanks.

In acknowledging the vote, Mr. Orr said he must, in the first place, apologize for being the only member of the firm present. His father was unfortunately too ill to be with them; and Mr. Sutherland, his other partner, was prevented by another engagement from being there. He was very much indebted to them for their kind vote of thanks, and he could only assure them that it had given him great pleasure to take them round the works. They were the first body of practical people whom they had conducted over their works, as they were a little careful of what they showed. He hoped the members had been impressed by all they had seen. He knew a great many gas managers thought they made a fat thing out of their business. Having seen the large amount of plant required, they would understand that the works were not run without a large outlay. A good many of the contracts they had with gas-works were on a sliding-scale; and as he thought this was the fairest way of doing business, he would advise all young engineers to adopt this method when they became managers of works.

Mr. Wilkie also acknowledged the vote on behalf of Mr. Ross and himself. In the course of his remarks, he strongly urged the members to stick in to work, night and day, and instanced Mr. Sutherland as an example of the distinction which could be achieved by close application to duty.

SOCIETY OF ENGINEERS.

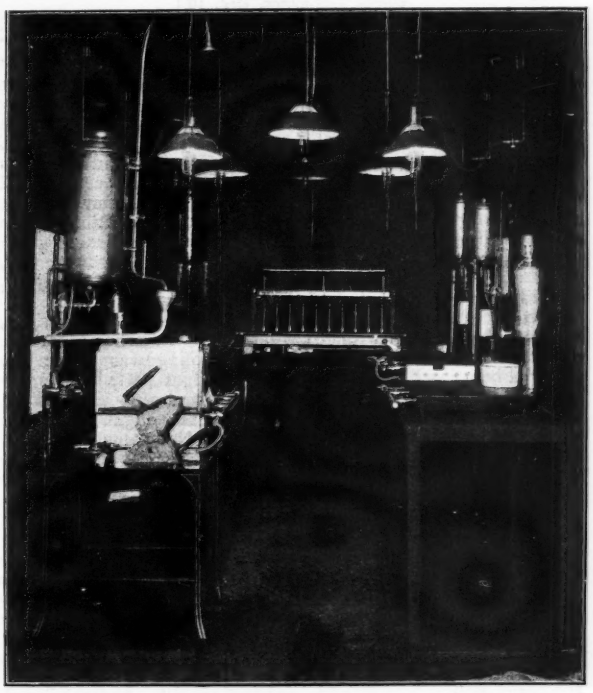
The Fiftieth Annual General Meeting of the Society was held on Monday last week, at the offices, No. 17, Victoria Street, Westminster. The chair was occupied by Mr. D. B. Butler, Assoc. M.Inst.C.E., the President. The following gentlemen were elected as the Council and officers for 1905: As President, Mr. N. J. West; as Vice-Presidents, Messrs. Maurice Wilson, R. St. George Moore, and Joseph W. Wilson; as Ordinary Members of Council, Messrs. J. Bernays, G. A. Goodwin, G. Green, W. H. Holttum, E. J. Silcock, D. A. Symons, J. Aird, and A. G. Drury; as Honorary Secretary and Treasurer, Mr. G. Burt; and as Honorary Auditor, Mr. Samuel Wood, F.C.A. The President announced that the following premiums had been awarded by the Council for papers read during the past session: The President's Gold Medal to Mr. W. E. Storey, for his paper on "Condensing Machinery;" and the Society's Premium to Mr. A. S. E. Ackermann, for his paper on "British and American Coal-Cutting Machines," and Mr. Frank Latham, for his paper on "Some Recent Works of Water Supply at Penzance." The proceedings terminated with a vote of thanks to the President, Council, and officers for 1904, which was duly acknowledged. The Jubilee dinner of the Society was held on Wednesday evening, at the Hotel Cecil—Mr. D. B. Butler presiding. The toast of the evening was proposed by the Astronomer-Royal (Sir W. H. M. Christie), and responded to by the President, who stated that the Society was the third oldest institution of engineers. Before separating, the company heartily honoured a toast proposed by the President to Mr. Perry F. Nursey, the Secretary and a Past-President of the Society, who has been connected with it for nearly the whole period of its existence.

Manurial Value of Waste Liquors from Coal-Tar Works.—In a recent issue of the "Zeitschrift für angewandte Chemie," Herr F. Strube describes a method for utilizing the waste liquors from brown coal-tar works as manure. The complete purification of effluents from these works, by ordinary methods, is expensive. Experiments have therefore been made to ascertain the effect produced when the water is used to irrigate fields. According to an abstract in the "Chemical Trade Journal," the important observation was made that the water not only had no ill effect upon the crops, but, on the contrary, a beneficial one. The yield of grain obtained from an irrigated plot was 17 per cent. more than from an unirrigated plot, which in other respects was treated in an exactly similar manner. The yield of straw and offal was also higher, and the grain obtained contained a larger proportion of nitrogen.

SOME UP-TO-DATE GERMAN GAS APPLIANCES.

Among the stands which, during the latter part of the time that the Earl's Court Gas Exhibition was open, attracted a large amount of attention was that of the German Continental Gas Association. Originally the exhibits shown were included in the loan collection, where neither water nor gas was obtainable; but owing to the frequently expressed desire to see them under working conditions, Herr Director Emil Funcke, of the Central Werkstatt Dessau of the German Continental Gas Association, was induced to move them to the Queen's Palace Annexe, where visitors were able to see them in operation. Had the stand been fitted up at the opening of the exhibition, it would certainly have been fully described in the "JOURNAL" for Nov. 22; and we are pleased now to call attention to the useful and original appliances for domestic and industrial purposes which were displayed, some particulars of which have been supplied to us by the representatives of the Association for the United Kingdom and its Colonies—the Incandescent Lighting and Mantle Insurance Company, of No. 57 and 58, Chancery Lane, W.C., who claim to have been pioneers of the maintenance system in England.

The hot plates manufactured by the Association are fitted with well-designed burners which may be turned down to the lowest point without fear of lighting-back, and which cannot become choked by the vessels boiling over. By an ingenious arrangement, the plates surrounding the burner can be lowered when quick boiling is desired; but when in the normal position, the hot plate



is maintained at such a temperature that vessels can be kept boiling on any portion of its surface, thus enabling from six to eight saucepans to simultaneously boil with only two burners. This is effected by enclosing the burners entirely on the underside of the plate and checking the flow of the products of combustion to the wrought-iron chimney at the back. The remaining heat is utilized during its passage up the chimney to heat water contained in a copper vessel which is provided with a tap. No smell whatever can be detected from the plates when in use; the whole of the products of combustion passing away through the chimney. One form of the apparatus is made with a plate-warming chamber below, so as to utilize the heat radiated from the underside of the hot-plate chamber. For heating flat irons, a convertible burner is provided at the end of the hot plate. This has a loose centre plug which, when turned, converts it into a jet burner over which a hollow iron can be quickly heated. Another type has combined with it a gas-oven heated by an atmospheric burner underneath, the lighting of which is effected without opening the oven-door, by means of a travelling flame. There is a loose shelf to prevent burning of the bottom part of cakes and pastry. Light and neat wrought-iron stands for ovens and hot-plates enable them to be placed readily in the most convenient positions for use.

Another appliance exhibited was a compact type of water-heater. This is automatic in its action, and is made in four sizes. When connected direct with a high-pressure water-main, the turning on of the cold-water tap automatically lights the atmospheric gas-burner by means of the bye-pass. This is accomplished by the water pressure acting on a valve which opens the gas supply to the burner. In less than a minute after lighting up,

boiling water is obtainable. Within the heater there is a centre double cone (inside which the water flows), and an outer water jacket. The cold water, on entering the apparatus, meets the waste heat from the burner; and on leaving the top of the centre cone, it passes the hottest portion of the heater and descends through the ring of the atmospheric burner. Should a supply of water at high pressure not be available, an automatic gas and water tap for low pressure can be fitted. A further advantage is that the inside portion of the heater can be easily removed for cleaning.

Other appliances exhibited on the stand included (as will be seen from the illustration) a mantle burning apparatus and a reversible tilter for flat irons. Special attention should, however, be directed to the adjustable incandescent lights intended for workshop use, three different types of which are manufactured. These were described and illustrated in the "JOURNAL" for Sept. 3, 1901 (p. 570), when it was stated that they had found extensive application in Germany. They can be suspended from the ceiling or fixed on the wall, and seem able to bear without detriment any amount of shaking and moving about.

THE APPLETON EXTENSIONS OF THE WARRINGTON WATER-WORKS.

By GEORGE MITCHELL.

[Abstract of a Paper read before the British Association of Water-Works Engineers, Dec. 10.]

The Appleton Water-Works were designed by the late J. F. L. Bateman, M.Inst.C.E., and were carried out in 1846; being extended in 1859 and 1901. Previous to the execution of the 1901 extensions, the works consisted of a storage reservoir of a capacity of 62 million gallons; two filters, having a sand area of 915 square yards; and a pure-water tank of a capacity of 300,000 gallons. The pure-water tank was originally covered by flags laid on girders supported by cast-iron columns; but as the roof had been allowed to get into a bad state of repair, it was entirely removed about eight years ago. The effect, however, was the production of large quantities of green growth in the water, in consequence of which it was resolved to construct a new covered pure-water tank; and, the filtering area being inadequate at certain seasons of the year, the old tank was converted into two filters.

The old filters were formed with clay puddle bottoms and sides, the latter being faced with brick on edge. In order to secure watertightness, Callender's bitumen sheeting was used; this material being well adapted to bear the slight periodical movements of the banks due to the varying amount of moisture in the clay. The old filters were rather shallow, so a slight excavation was necessary before the reconstruction of No. 1 could be commenced. A thin layer of fine concrete was then spread on the bottom, and carefully smoothed over. The bitumen sheeting was laid on this, and covered with a layer of fine concrete 5 inches thick, with a finishing coat of cement rendering. The sheeting on the slopes was protected by blue-pressed Staffordshire brick-on-edge paving, finished off with stone coping. Considerable difficulty was experienced in laying the bitumen sheeting, owing to the pressure of the ground water during wet weather; and holes had to be cut in the sheeting to relieve this—the holes being made good, and the paving completed, after the brickwork had set.

The floors of the filters are level longitudinally, but have a slight fall towards the main drains, which increase in section towards the outlet-wells. The filtering material consists of 2 feet of sand, supported by gravel of an average depth of 10 inches, supported on a false bottom of perforated tiles laid on lines of brindle bricks. The lines of bricks supporting the perforated tiles were laid flat rather than on edge. It may be mentioned that this form of under-drainage has been in use on other works for at least 30 years. The author believes that in many filters the depth of the gravel, which merely acts as a supporting and collecting medium, is excessive, and entails considerable extra cost (both in itself and in the extra depth of filter required) without any corresponding advantage.

The sand was obtained locally, and was treated as follows: It was first screened to remove the fine gravel, and was then washed in a sand-washer, of the type in which water under pressure is fed below a perforated plate whereon the dirty sand lies; the mud being carried to waste by the overflow of the water. The sand was vigorously stirred during washing, and after the water had been run off, the finest of the sand was skimmed off with shovels, and thrown to waste; that remaining being then washed in long troughs having a current of water constantly flowing in them—the sand being shovelled in small quantities into riddles held under water and vigorously shaken. Most of the sand passed through the riddles into the troughs, and the finest was again skimmed off and thrown to waste. The sand remaining on the riddles formed about 2 inches in depth of coarse sand on the filters, which acted as a supporting medium for the 22 inches of finer sand above. The above method produced very satisfactory clean sand; but the cost to the contractors was very great. The gravel was washed in troughs similarly to the sand, and was of three grades; the lowest being less than 2 inches diameter, the middle passing a 1 inch, and the upper passing a $\frac{3}{8}$ inch mesh.

The inlets to the filters are provided with Glenfield and Kennedy's non-concussive ball valves (fitted to act also as stop valves) to keep the water at a constant level; and the main drains discharge into wells containing Glenfield-Jones automatic regulators.

In most filters, air-pipes are connected to the upper ends of the subsidiary under-drains to allow the air to escape when the filters are being charged. In the author's opinion, such pipes are unnecessary and very undesirable. All filters should be charged with filtered water admitted from below at a very slow rate. By this means, the air in the filtering materials is forced gently upwards without any danger of breaking holes in the sand; and not until the water stands a few inches above the sand should unfiltered water be admitted, and then very gently. The only ventilation of the under-drains was secured by means of a 6-inch pipe at the top of the main drain. There are on record several cases where inefficiency of filters has been traced to the creeping of unfiltered water along the smooth surfaces of air or other pipes projecting through the sand; and the author believes that in many cases unfiltered water creeps down between the sand and the smooth surface of the filter wall. In order to guard against this, two courses of brick, projecting 1 inch, with a flush course between them, have been built at the middle of the sand layer, and the sand was carefully compacted round the projections.

It should be explained that the water is used exclusively for trade purposes, and the filters are merely required for the clarification of the water. Had the removal of bacteria been essential, the author would have increased the depth of sand to 30 inches, and used finer sand for the top portion.

The capacity of the pure-water tank or service reservoir at the Appleton works is 683,000 gallons. It is circular in plan, and constructed almost entirely of portland cement concrete. Before preparing the designs, trial pits were put down, which proved the rock tobe at a greater depth than was expected; and it was decided to keep the reservoir at a higher level. As the trial pits disclosed the presence of a fairly good clay all over the site, the author at first proposed to use puddle-clad work, but after looking further into the matter this idea was abandoned; and it was determined to employ Callender's bitumen sheeting as the watertight medium. The chief objection to the use of this class of material being the high cost of the necessary protective covering (which sometimes exceeds 10s. per square yard), it occurred to the author that in such a shallow reservoir it might be possible to place the sheeting at the back of the wall instead of at the front, by which means, the soil being clay without any stones, all protective covering would be dispensed with. This course was adopted.

With regard to the roofing of reservoirs, the author is of opinion that where thoroughly good work can be secured, cast-iron pillars form the ideal support; and these would have been adopted in this case had it not been for the difficulty experienced at the High Warren reservoir in securing the delivery of such in reasonable time. In the Appleton reservoir, therefore, the roof was supported on blue brick pillars, $1\frac{1}{2}$ bricks square. These were very long in proportion to their sectional area; and the author found great difficulty in arriving at their safe working strength—data on this point being very scarce. The roofing consisted of 4 to 1 concrete, $4\frac{1}{2}$ inches thick, with a tension bond of No. 8 expanded steel, carried on rolled-steel joists at 7 ft. 8 in. centres.

The cost of the reservoir was at the rate of about £3400 per million gallons capacity, which the author believes is fairly low considering its small size. The following details may also be of interest: The 6 to 1 concrete in the floor cost 18s. per cube yard; 7 to 1 concrete in the walls cost 17s. per cube yard; 4 to 1 concrete in the roof cost 23s. per cube yard; and the rolled-steel joists cost 9s. per cwt. fixed.

The cast-iron pipes were jointed by means of shallow sockets filled with lead; no yarn being used; and in the case of the 18-inch pipes, the whole of the joint was poured. A Venturi meter was fixed in the 18-inch discharge-pipe from the reservoir; and the rate of discharge, which varies from about 8000 to about 40,000 gallons per hour, is continuously recorded.

Having mentioned that the total cost of the works was under £10,000, the author gave particulars of the next extension of the works, which will be a storage reservoir of a proposed capacity of 190 million gallons. The embankment will be of the ordinary type—length, about 800 yards; maximum height, 57 feet; and width at top, 20 feet. The estimated cost of the reservoir and auxiliary works is £70,000.

Discussion.

Dr. AD. KEMNA (Antwerp) said it was seen from the paper that an exceedingly interesting experiment had been made at Warrington, but somewhat at the cost of the people of that town. Not keeping the roof of the pure-water tank in a good state of repair, and then having to remove it, was sure to result in the growth of green algæ. Regarding the author's practice as to sand filtration, it was seen that very great care was taken to ensure uniformity of size of grain, and to do away with the fine material. But in sand filtration, the very small grains were the most efficient part. The size of the grains was most important in

regard to the actual dimensions of the spaces between the grains. With large grains, there were large channels; with small ones, the channels were small. Therefore it would at once be seen what a great influence the size of the grains had on the percolation of water for purification purposes. Introducing grains of small size between the larger ones, they fitted in the empty spaces formed by the larger grains, and would block them up; and there they had the most efficient part of filtration. This was right from a theoretical point of view, and had been confirmed in practice. Therefore, unless there were some special reasons, he did not see the necessity or advantage in taking all this trouble to do away with the most efficient part of the sand. The author also showed that he washed the sand underneath, and mentioned that, in his opinion, air-pipes were unnecessary and undesirable. One of the first things that he (Dr. Kemna) did when he became connected with the Antwerp Water-Works was to do away with the air-pipes. They were only useful for spiders' nests. It was also a general practice to connect up a new filter with an ordinary working filter, and to admit the water underneath at a very slow rate, so as not to stir up the sand. But a good deal of dirt came out. This practice was adhered to at Antwerp until some years ago, when he (Dr. Kemna) found that for every advantage, they had a drawback. If a filter was regularly washed underneath after each cleaning, the sand was more or less loosened. Compared with a filter which was not washed underneath, and in which the water was admitted from above, there was a noticeable difference in the hardness of the sand. If, therefore, they washed from underneath, they took away a certain amount of dirt, and also let in a certain amount, because the sand was loosened. All these experiments were first made by him in the laboratory; and then he pursued them on a large scale, with one or two filters working in one way comparatively with a similar number working in the other way—both being always controlled by chemical analyses and bacteriological analyses. While the latter showed that there was not much difference between the two ways of working the filters, if there was a difference it was distinctly in favour of the unwashed filter, which proved, what seemed to be somewhat paradoxical, that the dirtier a filter was the better it worked. Then another general practice was to run the first effluent of a filter to waste. He had adhered to that for many years; but he had also given it up altogether. If they considered what must be the succession of phenomena when a filter had been stopped for cleaning, and was then started again, they found the following: The first water that came off was, of course, that which was at the bottom; and through the filter not having been emptied completely for cleaning, that first water had remained perhaps 24 or 36 hours longer in contact with the sand than the ordinary water; and therefore it ought to be the best. If they made a bacteriological analysis of the effluent of the filter hourly, then they found that this theoretical conclusion was absolutely borne out by facts. So that there was no reason to throw that water away; on the contrary, there was every reason why they should keep it. And, therefore, if they knew how deep they had drawn the water for cleaning, the thickness of the material, and the porosity of the sand, then they could calculate approximately at what time that supply would be exhausted, and the new supply be coming through. It would be found that, according to the speed the filter was being worked, after a certain number of hours, after very low bacteriological figures, they would get a marked increase. Instead of 15 or 20 colonies, they would get perhaps 150 or 200. This latter was the first water that was poured on to the filter after cleaning; and this was the water that should be run to waste.

Mr. F. Griffith (Leicester) asked Dr. Kemna how often he washed the sand right through to the shot, so as to remove the filth that might be remaining in the sand below the level of the water. He had followed the system for 20 years past of washing the filters every three years right through to the gravel. They washed the sand until it was absolutely clear of any discolouration, and replaced it periodically, so as to remove all filthy matter which might accumulate. Surface washing they were obliged to do at periods of (say) ten days—that was to $\frac{1}{2}$ or $\frac{3}{4}$ inch deep.

Dr. Kemna said he had filters which had been working since 1881; and they had been cleaned completely only once during that period. He left the sand on the bricks and everything else as much alone as he possibly could. The sand was gently scraped off—not shovelled; and the dirty layer was taken away and washed every time. When about a foot of the sand had been taken away by successive scrapings, then it was replaced.

Mr. R. Askwith (Bishop Auckland) remarked that, of course, the time in which it would be necessary to wash the sand would depend upon the class of water that was being filtered. With upland water, they had to wash the sand more often than had been suggested; and he had no doubt that Mr. Griffith found he had to do so at Leicester. His own practice was to wash his filters in steps—say, one filter 24 inches one year; the bed next to it 18 inches; the bed beyond that 12 inches; and the bed beyond that 6 inches. Washing them down in rotation in this way, they had a better average quality of water than if they washed every bed down completely in one year—such a good effluent would not be obtained as by his method. He found it necessary to wash the beds down to the bottom once in every four years, because if they were not washed completely through, they would not get a reasonable quantity of water passed.

Mr. Easton Devonshire (London) said that one of the things he did not quite understand was the advantage of making the bottom of the filter of perforated tiles, which, according to the drawing accompanying the paper, were carefully jointed. He could not see the advantage of carefully jointing perforated tiles; nor did he think there was any need for the perforated tiles. In Belgium, they used small bricks. They placed them end to end in the first layer (using a rough stock brick); and then the others were spanned across from centre to centre of the parallel rows. The irregularity of the bricks gave them all the passage they required for the water. Regarding the service reservoir referred to by the author, he (Mr. Devonshire) thought its cost for a comparatively small quantity was fairly satisfactory; but it might have been cheaper. As many of them were aware from the paper he read last year, they (the Antwerp Water-Works Company) were building a tank now; and it was costing them £2780; but it had a capacity of $1\frac{3}{4}$ million gallons, which was greater than the one referred to in the paper. He thought the extra cost was due to a great part of the expense being in the columns. Whether they should not have been of concrete instead of bricks, he did not know. It would, anyway, have been cheaper and stronger.

Mr. William Watts (Little Don Valley Water-Works), referring to the use of bituminous sheeting, said it might be necessary where bad work was introduced; but he did not think, where concrete was properly mixed and levelled in position, there was any need whatever for bituminous layers. He was speaking after having made many walls and tanks without it; and everyone had been built successfully. He was now engaged in making a clear-water well to hold a million gallons; and he was trusting entirely to the goodness of the concrete to be impervious. The $4\frac{1}{2}$-inch roof for the reservoir seemed to him to be too slender altogether. It was almost veneer work; and was too little for a circular covered tank. Neither did he think there was any need for introducing metal into the concrete. As to the proposed new storage reservoir, the embankment seemed a large one for so small a reservoir.

Mr. C. H. Priestley (Cardiff) said he had had a set of three filters at work for seven years, and they had never been cleaned to the bottom. Before that, they had filters in for fifteen years without cleaning to the bottom. Then they were cleaned out; and he thought their filters were quite competent to go that time. He was surprised to hear Mr. Griffith give an average of ten days for cleaning the surface of the filters. In some cases they had to clean at Cardiff after (say) seven days; while in others they went for seven weeks. There was no such average as ten days in their case.

Mr. W. Mathews (Southampton), remarking on the construction of the reservoir, pointed out that the author thought that cast-iron pillars formed an ideal support for the roof; but he did not use them because in previous work they had difficulty in connection with their supply from an old-fashioned foundry. He (Mr. Mathews) thought this was the poorest excuse he had ever heard for discarding an ideal form of construction. The blue brick pillars which were built were only $1\frac{1}{2}$ bricks square. This was very small. He was also interested in the statement as to the cast-iron pipes being jointed by means of shallow sockets filled with lead, no yarn being used; and in the case of the 18-inch pipe, the whole of the joint was poured. It would be interesting if the author could give a section of that. If it could be done satisfactorily, it was a thing that many of them had been seeking for a long time. Another protest was against the latter part of the paper, where it referred to the next extension of these works being a storage reservoir. He (Mr. Mathews) did not think their proceedings should be open to the description of works which had not yet been carried out, unless under exceptional circumstances.

Mr. P. H. Palmer (Hastings) pointed out that the author told them this particular water was required for trade purposes. It seemed rather peculiar, unless the water was wanted for some special trade, that so much trouble and pains should have been taken to filter it. He also thought it wrong to have washed out the fine sand, unless it was necessary to get a special water for wool washing or some similar purpose.

Mr. S. R. Lowcock (London) said the author was extremely vague in all he had said about the sand. If he could give them the sizes of the riddles he used, and the dimensions of the sand he was aiming at, it would be of assistance. To say the finest sand was skimmed off and then thrown away, was very vague. It might mean anything. Regarding the construction of the ridges round the filters, to prevent the water from creeping down the sides, it was a practice he (Mr. Lowcock) had adopted for many years. It was an excellent one, and certainly did prevent the creeping of water. He disagreed with Mr. Mathews as to descriptions of projected works being brought forward; and regarding the proposed reservoir referred to by the author, he did not think it was a good thing to carry the outlet through the puddle wall—it should go through solid ground.

The author was not present to reply to the discussion.

Dry Meters at Belfast.—The Belfast Gas Committee, having considered the question of the supply of dry meters, have unanimously resolved that consumers who desire a dry meter in lieu of a wet one, and who are otherwise debarred by the resolutions of the Committee from getting one, may obtain it on depositing half the cost of same; the deposit to be refunded on the person returning the meter, or at the end of a period of five years.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Nanterre v. Aalborg Conveyors.

Sir,—Perhaps I should be consulting my own dignity better by not noticing Messrs. Graham, Morton, and Co.'s advertisement in your last issue; but, considering that the firm in question has so prominently employed the word "false," I am constrained to ask you to allow me space for a few words.

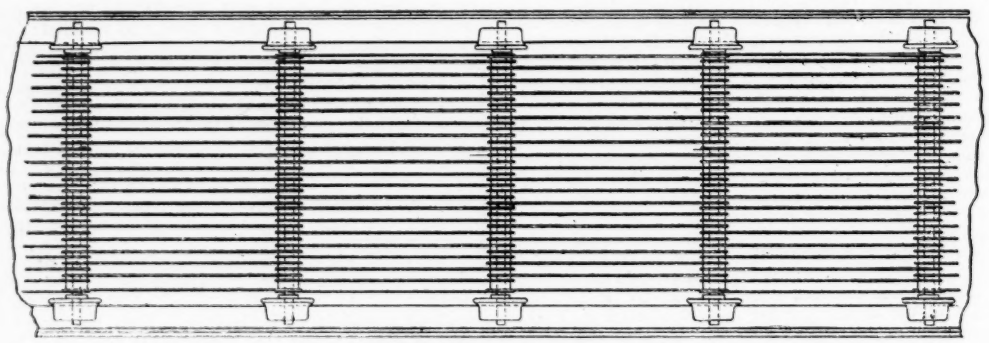
To begin, I beg to state that I had nothing whatever to do with the design, construction, or erection of the Nanterre conveyor, which is entirely the work of Messrs. Graham, Morton, and Co.; but I further state most emphatically that the principles of the said conveyor are a direct infringement of the principles of my invention, and which are embodied in the little model at the gas exhibition at Earl's Court.

It is only necessary to compare the claims and diagrams in the two specifications to make it apparent, even to the lay mind, that Messrs. Graham, Morton, and Co.'s claims are practically identical with mine. But, unfortunately for them, they were a little late in formulating them. For instance—

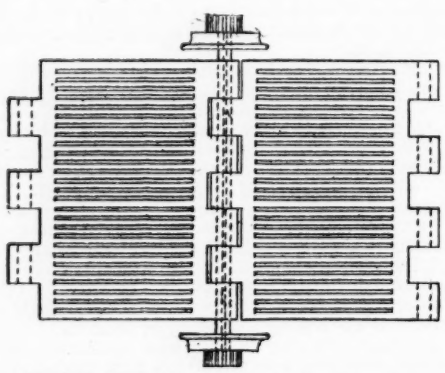
Marshall's Specification. No. 18,131 of 1902.	Graham's Specification. No. 1560 of 1903.
"I claim the construction and use of actual conveyors or *carriers of grids* or *screens*, which act as *drainers of water* used for quenching purposes, either *round bars* or *flat bars* on edge, or *plates with openings*," &c., &c.	"I claim a perforated travelling *grid* or conveyor, whereby the coke after being *quenched* is *drained of its superfluous moisture*," &c., &c.

Messrs. Graham, Morton, and Co. likewise claim the use of "scrapers" attached to the bottom of the grids; but these had already been shown in my specification. Again, comparing the two diagrams, it is apparent that they are practically one and the same. Messrs. Graham, Morton, and Co. have adopted a "plate with openings," which is clearly protected.

Messrs. Graham, Morton, and Co. cannot even plead ignorance of my claims, as long before they constructed the Nanterre conveyor, they were warned—both by myself and others—of the false position they were taking. That Messrs. Graham, Morton, and Co.'s action in annexing a patent to which they had no tittle of right excited comment is clear from a letter I received in April, 1903, from Messrs. Drake and Co., of Halifax, with whom I was quite unacquainted—pointing out that Messrs. Graham, Morton, and Co. had taken out a patent "identical with mine," and offering to send me further particulars.



Marshall's Arrangement.



Graham, Morton, and Co.'s Arrangement.

Only a few days ago I received credible information that Messrs. Graham, Morton, and Co. had offered their "patent" to an American firm, but were very plainly informed that they were forestalled. They cannot even claim second place as the inventors of a "grid" coke-carrier, as Messrs. Gibbons Bros., of Dudley, are the holders of a patent which is prior to theirs.

Hitherto I have employed every friendly effort to come to an understanding with the firm in question, but have only been met by rebuffs; and, in answer to my Solicitor's repeated demands for an explanation, I have received from their legal representative disingenuous and frivolous replies.

That the British patent laws are much to blame for the existing state of affairs, cannot be denied; but, in spite of bombastic and personally offensive advertisements, Messrs. Graham, Morton, and Co. have yet to learn that there is still justice in the land, and that people are not to be bustled out of their property.

Queen Anne's Chambers, S.W., Dec. 15, 1904. F. D. Marshall.

The Testing of Burners and Mantles.

Sir,—I am afraid I cannot tell Mr. Wernham the name of the burner on which I obtained the results shown in the diagram, unless I give a free advertisement, which I do not intend to do. I may, however, state that the burner was a fairly cheap commercial one, and was tested with a mantle and under conditions that had been found to suit other burners of a similar type which would give the best results with Halifax gas.

Halifax Gas-Works, Dec. 15, 1904. Jas. F. Smith.

The Early History of Prepayment Gas-Meters.

Sir,—In reference to your editorial remarks on p. 823 of your last issue, bearing on the increasing importance of "penny-in-the-slot" consumers, and referring by name to some who had influence in the early development of the idea, I do not know whether I may rightfully claim to be included with them; but for many years my association with gas, and acquaintance with the artisan class, convinced me that there were large potentialities in the proper cultivation of this field for enterprise.

I had in those days many talks about it with gas managers, and as to the apparent difficulties of collection; the result being that I devised a prepayment meter, and secured protection for it. The provisional specification was dated Nov. 26, 1887 (No. 16,291). This meter was made for me by Messrs. W. & B. Cowan, and is referred to in an article appearing in the "Journal" for May 22, 1888, p. 908.

Of course, my ideas of meter-making were soon superseded by those of several expert meter manufacturers who gave attention to this new departure; but it remains a satisfaction to see how great has been the development of those early expectations.

Millwall, Dec. 16, 1904. Saml. Cutler.

[Reference to the "Journal" for May 22, 1888, alluded to by our correspondent, shows that recognition to an extent was made of Mr. Cutler's services in the early history of prepayment gas-meters, when discussing a paper on the subject read by Mr. J. T. Lewis, of Wellingborough, before the Midland Association of Gas Managers. Any detailed discussion of Mr. Cutler's meter was impossible at the time, in view of the fact that the inventor abandoned his application after filing a provisional specification. He, however, now encloses a copy of the document, and we reproduce it below, so that due credit may be given, even at this late day, for Mr. Cutler's services in regard to what has become so important a branch of gas supply.]

The object of this invention is to construct gas meters in such a manner that they may be adjusted so as to pass only a certain maximum or any determined less quantity of gas, before ceasing to supply or be readjusted.

This invention (of which two modifications are hereafter described) consists in connecting with the index a wheel that shall make only one, or something less than one, revolution for each maximum quantity of gas the meter is adjusted to supply without readjustment. The spindle of this wheel passes through a stuffing-box into a chamber, into which the inlet gas-pipe opens; the chamber being situated so that the gas flows through it before entering the ordinary valve-box in the case of a wet meter, and before entering either measuring compartment of a dry meter. Upon this spindle is fixed a peculiar shaped cam, which revolves with it. Across the periphery of the cam there is a roller from which is suspended—by hanging arms working in suitable guides—a valve that has its seat at a suitable point in the chamber or part of the gas-conduit. The outer end of the spindle has a knob and pointer which revolve round a suitable dial placed in the front of the index or meter. The knob is used to draw the wheel out of gear with the index train, and, by turning it, to readjust the meter.

The action is very simple. The meter being constructed to supply

(say) a fixed maximum quantity and then cease, is adjusted by drawing the wheel out of gear with the index train, and then by turning the spindle of a pinion gearing into the wheel (by means of a knob, milled head, or key) until the pointer, reaching a particular spot marked on the dial, corresponding to the quantity of gas it is desired the meter shall allow to pass, indicates that the valve is open to the extent desired. The gas flowing through the meter will then cause the wheel and cam to revolve in the contrary direction to that by which the valve was adjusted, and will continue to do so until the determined quantity had been reached, when, by virtue of the form of the cam, the valve will fall and shut off the supply. To readjust the meter, the wheel will have to be drawn out of gear again; and the same operation described above will have to be repeated.

A modification of the foregoing consists in extending the spindle of the pinion which gears into the wheel before mentioned and causing it to pass through a stuffing-box into the chamber in which the valve seat is situated. This spindle has upon it, near its rear end, a screw, which passes through a valve having a thread cut in it, so that as the pinion revolves, the valve is gradually screwed towards its seat until the wheel has made, or nearly made, a complete revolution, when the valve will be completely closed and the supply shut off. The mode of adjusting and readjusting is the same as before described.

Another modification consists in fixing upon the shaft or spindle of the wheel a cam, the periphery of which (when revolving) operates upon a valve hung either perpendicularly or at a slight angle to the vertical, and keeps it open; but when a certain stage is reached, the valve is released, and by its own gravity falls and closes the inlet, thus shutting off the supply.

In either of the plans described, the valve may be so arranged as to give a full gas-way until nine-tenths (or more or less as found convenient) of the maximum quantity has passed; but during the last small portion, the area of the inlet will decrease, and so give warning that the gear of the meter requires readjustment.

The invention, with its modifications, is equally adapted to wet as well as dry meters; and, instead of the valve being placed in connection with the inlet supply, it may be so arranged as to be connected with the outlet conduit of the meter.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Thursday, Dec. 15.

(*Before Mr. Justice* BRAY.)

Hucknall-under-Huthwaite Urban District Council v. South Normanton, Blackwell, and Hucknall Gas Company, Limited.

This was a case stated by Mr. Ram, K.C., as Umpire in an arbitration between the above-named parties to decide what sum should be paid by the Council to the Company for their undertaking.*

Mr. FREEMAN, K.C., and Mr. E. POLLOCK appeared for the District Council; Mr. HONORATUS LLOYD, K.C., and Mr. M'CARDIE represented the Gas Company.

Mr. LLOYD explained that there were two agreements, by the first of which, dated Feb. 4, 1903, it was agreed that the Company should sell and the Council should purchase all the works, pipes, mains, meters, and other gas apparatus, and all other real and personal property, and all effects of the Company which were laid down or situated in the urban district of Hucknall-under-Huthwaite, free from all debts and liabilities, and all easements, rights, powers, authorities, and privileges enjoyed or exercisable by the Company existing at the date of the completion of the sale; and all contracts and benefits of all contracts in subsistence at such date, so far as they related to the supply of gas by the Company within the urban district. Counsel contended that, on the true construction of this paragraph, the District Council were bound to purchase such portion of the undertaking of the Company as was situated within the urban district, and that it was the Umpire's duty to award such sum as should represent the amount which, in his judgment, they should pay for it. It was contended on behalf of the Council that they were bound to purchase only the pipes, mains, and meters belonging to the Company situated within the urban district, and that it was the Umpire's duty to award such sum only as represented, in his judgment, the value of such mains, pipes, and meters. It was proved or admitted that there was not any gas apparatus or real or personal property or effects of the Company of any kind, other than the mains, pipes, and meters, in the urban district, or any easements, rights, powers, authorities, or privileges so situated, other than those of laying and maintaining the mains, pipes, and meters, and supplying gas by contract with their customers, and of opening the roadways for this purpose with the permission of the Council. The first question for the opinion of the Court was as to which of the two contentions was correct. If the Court came to the conclusion that the Company were right, the Umpire awarded them £4280, in respect of the matters set forth in the paragraph; but if not, then he awarded the Company only £750. By the third paragraph of the first agreement, it was agreed that, in the case of arbitration, and in the event of the Council not continuing to take a supply of gas in bulk from the Company, the Arbitrators or their Umpire should be entitled to take into consideration, in fixing the purchase-money, the value of any mains or pipes outside the boundary of the urban district of Hucknall-under-Huthwaite which had been laid and put down by the Company for the purpose of supplying and taking the gas from their works at Blackwell to the urban district of Hucknall, and which, by reason of the sale, should be rendered useless or unremunerative to them; and also, in making the award, the Umpire should be entitled to take into consideration any capital money which he might consider to have been expended on the works for the purpose of equipping and rendering them capable of supplying the urban district of Hucknall-under-Huthwaite with gas in addition to the area and the limits of supply prescribed by the South Normanton and Blackwell Gas Provisional Order of 1892, and which should, by reason of such sale, be rendered useless or unremunerative to the Company. The supply of gas in bulk already mentioned was to be given by the Company to the Council under and by virtue of an agreement, called the second agreement, dated Feb. 4, 1903. By the first paragraph it was agreed that, from and after the completion of the intended sale and purchase, the Council should take, and the Company should supply the Council with, such quantity of gas as should from time to time be required by the Council at the price of 3s. per 1000 cubic feet. By the fifth paragraph, it was agreed that the second agreement should be determined by either party giving to the other twelve months' notice. It was proved before the Umpire that no notice to terminate the second agreement had ever been given, and that there was a neighbouring source of supply other than the Company from which it was possible that the Council might obtain gas in bulk. It was contended by the Company and denied by the Council that the Umpire ought to take into consideration, in fixing the purchase-money, the matters set forth in the third paragraph of the first agreement. The second question for the opinion of the Court was as to which of these contentions was correct. If the Court considered that the Umpire ought not to take into consideration the matters set forth in the paragraph named, he found that no sum was due to the Company from the Council in respect of them. If, however, the Court was of a contrary opinion, then he awarded the sum of £912 as due to the Company from the Council. He (Mr. Lloyd) contended that the Company were entitled to be paid for their contracts with customers. They could only sell gas by contract with each customer, however small. The purchase of the works, together with the benefit of the contracts, must mean the purchase of the undertaking. On the second point, he submitted that the intention of the agreement was that the Company should be compensated for their works outside the area of the Council which were used to supply gas to the district, because in the event of the Council discontinuing to take a supply of gas from the Company these works would be a kind of white elephant in the hands of the Company. They would be useless; and therefore some allowance ought to be made for the capital money spent upon them.

Mr. FREEMAN having replied on the first point,

His LORDSHIP said he would not trouble him on the second point. In giving judgment, he said the first question was one of some little difficulty. The contention of the Company was a very broad one. It was, in effect, that the part of their undertaking which belonged to this particular district was what was purchased by the Council, and therefore it ought to be purchased in the usual way by ascertaining the profits and capitalizing them according to value, taking into consideration the precarious nature of the profits. The contention of the Council was that it was simply the things named—mains, pipes, meters, &c.—which ought to be valued; and that nothing ought to be included for any such thing as goodwill. It was a pure question of the construction of the agreement. The recital of the agreement showed that the Company had no real powers, and that they had only supplied gas in the district by permission of the Council. The words which gave him most difficulty were those in the agreement which related to subsisting contracts. To his mind, however, this meant particular contracts, and he did not consider that it referred to the general power of contracting. The contention of the Council was consequently correct. He was clearly against the Company on the second point, and he therefore gave judgment in favour of the Council. At the same time, he thought both sides ought to pay their own costs.

* See "JOURNAL," Vol. LXXXV., p. 639; Vol. LXXXVI., pp. 727, 871.

The Liquidation of the Heathfield Natural Gas Company.

In the Chancery Division of the High Court of Justice last Friday, the case of *Watts v. The Natural Gas-Fields of England, Limited*, came before Mr. Justice Warrington. Mr. H. Terrell, K.C. (Mr. F. Cassel with him), appeared on behalf of the Company, and stated that the plaintiffs, Messrs. Inverness Watts and Charles Edward Masterman, on behalf of themselves as debenture-holders, had on the 15th ult. obtained an order for the appointment of a Receiver. The Company now applied that this order, which purported to have been made with their consent, but which, in fact, had not been obtained, should be discharged, or that the Receiver should be discharged, on the grounds that the debentures which the plaintiffs said they held were absolutely void, and that the debentures were part of a scheme to defraud the creditors, and prevent a voluntary winding up being proceeded with. Notice of motion was given on the 14th of November for the 18th; but on the 15th the plaintiffs appeared, and, purporting to act with the consent of the Company, obtained an order for a Receiver (see *ante*, p. 623). The Receiver had refused the Liquidator in the voluntary winding up any access to the books; and the Company now asked that he should be ordered to deliver them up to the Liquidator. Counsel explained that the Company was formed to work certain fields of natural gas at Heathfield, in Sussex; and it was a reconstruction of an old Company. In the summer of the present year, the Company got into serious difficulty, and execution had been levied on them by a judgment creditor. The shareholders appointed a Committee of Investigation, and their Accountant reported that there had been gross irregularities in the management, and that the Company was hopelessly insolvent. Shortly before the Receiver was appointed, the Directors, Messrs. Nussey, Masterman, and Watts, issued to themselves £3000 of debentures, covering the whole of the property, on the ground that they had found money and become sureties for the Company. The Company alleged that the debentures were void, and that Masterman and Watts were not properly constituted Directors. They said they delayed issuing the debentures because they would have had to register them, and the creditors would have learned it, and come down on the Company; but the fact was they kept this verbal agreement up their sleeve until the report was made by the Accountant, and

then they issued the debentures and asked for a Receiver. Mr. Gore Browne, K.C., and Mr. Whinney, who appeared for the plaintiffs, argued that the question of fraudulent preference was one which should be tried, and that the Receiver ought not to be discharged until this had been determined. Eventually, his Lordship said he was of opinion that the good faith which ought to be manifest in an application for a Receiver had not been observed in the present case. It was therefore his duty to discharge the Receiver, and order him to deliver up to the Liquidator all the property and books of the Company. Plaintiffs must pay the costs.

Question as to Interference with a Water Service.

At Wednesbury, last Tuesday, Messrs. J. & R. Rose, nut and bolt manufacturers, of Darlaston, were summoned by the South Staffordshire Water-Works Company for making an alteration in apparatus connected with the service-pipe used by another person without the consent of the Company. Mr. Johnson prosecuted: and Mr. Joy defended. The case for the Company was that three houses in Willenhall Street, Darlaston, were found to be connected with a private drain, so constructed as to carry all the waste water running from the sinks into a gully, from which it made its way into a catch-pit at defendants' works, opposite the houses. The Company contended that the drain was connected with the water supply, and that their consent must be obtained to any alteration. An inspector stated that when the taps over the sinks at the houses in question were turned on, clear water ran into the catch-pit in a few minutes. In cross-examination, he said there was no suggestion that any service-pipe had been actually tampered with. He was unaware that the gully connected with the works existed before the main sewer was constructed more than twenty years ago, and that the water had been running into a tank there for the same length of time. The Stipendiary (Mr. Neville) inquired how the case came within the section under which the Company were taking proceedings. He said he failed to see what they had to do with the water after it had passed over the sink, and why defendants should not use it. Mr. Johnson remarked that he could not tender evidence to show that the water was improperly used, as it was inadmissible. Replying to the Stipendiary, he said his contention was that the use of the drain amounted to an alteration of apparatus connected with the service-pipe. The Stipendiary: Surely the service-pipe ends with the tap. Mr. Johnson remarked that, if the Stipendiary held this, he failed to see what remedy the Company had. He urged that the view taken of the section was too narrow, and that "connection" meant simply something having relation to the service-pipe. The Stipendiary held that there must be actual physical connection. Mr. Johnson intimated that, under these circumstances, it was useless to proceed with the case. The Stipendiary added that he was satisfied the section only contemplated interference with the water before it was actually discharged from the tap. The summonses were dismissed; and the Stipendiary intimated that, if required, he would state a case.

Rochdale Trades Council and Free Gas-Stoves.—The Rochdale District Trades Council have adopted a resolution calling the attention of the Gas Committee to the plan of supplying gas-stoves without rental and free of cost of fitting adopted in some other towns, and urging them to introduce it into Rochdale. Mr. Turner, in making the proposal, said he thought the profits made by the Gas Committee were so large that the system might well be adopted. It might mean an initial expenditure; but he believed that this would come back in increased receipts from gas consumption.

Gas Profits at Southport.—Alderman Travis, the Chairman of the Southport Gas Committee, in moving the adoption of the minutes of the Committee at the last monthly meeting of the Town Council, drew attention to the revenue account for the six months ending September. A profit of £966 for the summer half year was altogether a new feature; and he thought they had only one instance like it, when the gas was 3s. 3d. per 1000 cubic feet. They might expect a very good profit for the full year. The deficit last year for the similar period was £679; so that they showed an increase of £1644 on six months' working. This was accounted for by the facts that they had sold more gas, the price of coal was lower, the cost of labour was less, and they had obtained a larger return for the residuals.

Gas Pumping at Dereham.—In his monthly report, the Surveyor to the Dereham Urban Council (Mr. H. G. Himson) states that during the past five weeks the gas-engine had been at work 29 days and the steam-engine 6 days. The average number of hours per day during which pumping has been carried on has been 8 hrs. 5 min.; and the average quantity of water pumped per day has been 54,220 gallons. The gas consumed per 1000 gallons of water raised was 38·98 cubic feet; and the quantity used per hour averaged 273·5 cubic feet. The reason for the increase in the quantity of water pumped per day and the number of hours' pumping was that during the past month the new gasholder tank had been filled with water. The average consumption per day during the time the tank was filling has been about 64,000 gallons.

Bristol Public Lighting.—The Bristol Gas Examiner, when he comes to draft his next quarterly report, will have to record a considerable addition to the number of public gas and oil lamps in the city. At present the number in 8219; 74 new lamps having been erected during the past three months. The consumption of gas in the city and extended area during the quarter amounted to 41,383,155 cubic feet, of which amount the public lamps consumed 40,363,355 cubic feet and the offices and hospitals 1,019,800 feet. These figures show a decrease of 3,559,173 cubic feet as compared with the corresponding quarter of last year, and a falling off in the total amount paid of £673 15s. 10d. This is due to the Corporation carrying out the lighting, extinguishing, and repairing of the lamps, as well as to the reduction in the price of gas. The gas bill last quarter came to £4051 0s. 3d.

REGISTER OF PATENTS.

Manufacture of Strengthened Pipes.—Thompson, W. P.; a communication from A. Bonna, of Paris. No. 17,204; Aug. 7, 1903.

This invention consists in introducing in the composition of pipes products having a certain elasticity and not liable to be attacked by certain fluids, such as lighting gas or acidified water. At the same time various metallic bases which enter the composition of these pipes, or of their joints, are arranged in such a way that they impart to the pipe, or to the joint, sufficient elasticity to allow of expansion, contraction, and twists, while preserving perfect tightness in the pipe.

The pipe first described is composed of concentric casings, formed of a metallic framework comprising a band of corrugated or other steel wound spirally; the framework being enveloped in a casing of tar, bitumen, or asphalt, mixed with lime or fine gravel. When it is necessary to obtain elasticity and flexibility in the pipe, a plastic coating (of rubber-coated bitumen and asbestos) of a fibrous nature is preferably employed. The external casing is also formed of a metallic framework of corrugated steel of variable section according to the pressure to be resisted, resting on rods enclosed in a cement mortar, the contraction of which acts concentrically and thus allows of perfect adherence being obtained with the internal casing. To permit of the pipes being joined, the internal casing of strengthened asphalt or tar projects beyond the external casing in order to form the tube ends, which are covered with a ring of india-rubber or rubber-coated bitumen applied cold. This ring is gripped by a collar formed by a corrugated metallic band wound spirally in such a way that the successive spirals engage one with the other. The corrugations of the band are such that the spirals cannot become disconnected from one another after they have been connected, and are such as to allow of a certain amount of play, enabling the flexible collar to bend, elongate, and contract without breaking and without destroying the tightness of the joint.

Burners for Incandescent Gas-Light or for Heating Purposes.—Shoob, I., of Wardour Street, W. No. 24,228; Nov. 7, 1903.

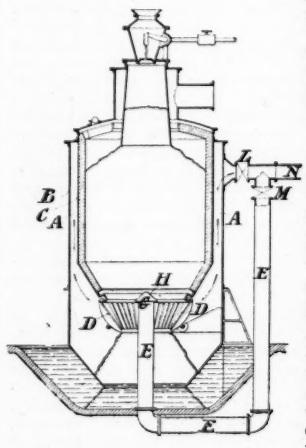
This invention relates more especially to burners employed for inverted incandescent gas-lights. It is found, says the patentee, that inverted burners as hitherto constructed burn best when in a vertical position; but if tilted or inclined to one side or the other, they have a tendency to smoke—a defect believed to be due to the fact that the flow or passage of fresh air to the mixing-cone is disturbed when the burner is moved out of the vertical position.

The object of the invention, therefore, is to provide a burner in which the regular supply of air to the mixing-cone may be secured "so as to obtain an intensified light in whatever position the burner may be moved or placed." The burner may then be secured in any desired position, and moved into various positions without ill effect—"thus rendering the burner applicable as a portable gas-lamp for lighting or heating purposes."

The arrangement proposed is similar to the "Globe" light already described in the "JOURNAL"—See Vol. LXXXV., p. 828.

Gas-Producers.—Mond, L., of Regent's Park, N.W. No. 27,496; Dec. 15, 1903.

This gas-producer has a circular grate in the form of an inverted truncated cone, between the bars forming the periphery of which the air, steam, or mixture of air and steam, is supplied to the producer. The fuel hopper at the top has an extension projecting downward for a distance into the producer, and preferably of conical shape. These features of a producer are described in patent No. 12,440 of 1893.



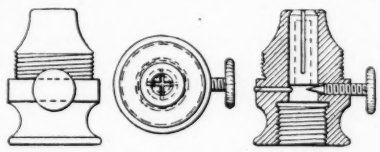
By the present invention, there is introduced into the lower part of the producer—preferably axially through the grate—a blast-pipe for supplying air, steam, or a mixture of air and steam, in addition to that supplied through the grate. The proportion of blast having access to the producer through the pipe and grate respectively should be regulated; and for this purpose the blast-mains are provided with valves. The pressure of each blast may also be controlled by separate fans or the like. As in the producer described in the earlier patent, the blast may be preheated by passing through a jacket surrounding the producer.

The producer shown is practically the same as that described in the previous specification, but is so arranged that the air or air and steam blast enters the pipe N and is divided—one part passing through the annular space A between the two wrought-iron casings B and C of the producer (as indicated by the arrows) to the bars D, while the other part passes through the pipe E to the tuyere G. The latter is covered with a hood H, which prevents any fuel from entering it.

In order by this method to obtain producer gas of high quality, it is important, the patentee points out, that the proportion which the air or air and steam blast passing to the pipe E bears to that passing to the grate D should be accurately adjusted. For this purpose, the two valves L and M are provided; or, with the object of achieving this result more effectively, two different fans or their equivalent may be employed to provide the necessary air or air and steam blasts, in which case the pipes N and E, through which the blasts are supplied to the tuyere and to the grate, would be independent of one another.

Gas-Burners.—Müller, R., of Berlin. No. 25,467; Nov. 21, 1903.

This invention relates to a gas-delivery nozzle with adjustable discharge apertures; and, in combination with a bunsen burner tube, the nozzle constitutes a bunsen burner. The upper part of the nozzle casing is conically tapered as shown; and in its wall a screw with a finely tapering point is closely fitted. Within the nozzle is also



arranged a hollow cap provided at its upper part with the usual cross-shaped outlet slits. The yielding walls of the cap permit of adjusting the width of the discharge apertures; and for the same purpose there is provided on the cap a cone, which co-operates with the tapered portion of the nozzle. By the adjustment of the screw, the cap may be displaced in the direction of the axis of the nozzle; and in this way the yielding walls of the cap are more or less compressed in the conical tapering of the nozzle—the screw point acting in the manner of a wedge. Upon rotating the screw in the reverse direction, the socket moves back, owing to the pressure which its parts exert in separating one from the other against the conical guide.

Gas-Engines.—Reichwald, A.; a communication from Fried. Krupp Aktiengesellschaft, of Essen, Germany. No. 27,992; Dec. 21, 1903.

This invention particularly relates to the arrangement of the inlet and outlet valves of gas-engines. Hitherto it has been usual to apply these valves to cylinder heads or to the covers of the cylinders—putting the inlet valve on the top and the outlet valve underneath. The disadvantage of this arrangement, however, is that the outlet valves are not easily accessible, and, in addition, difficulties arise in the uniform cooling of the cylinder heads or covers, and not infrequently they split owing to unequal expansion. This invention therefore is to obviate these disadvantages by placing all the inlet and exhaust valves upon the back of the cylinder. For example, an inlet and outlet valve is placed in a common valve chest; and the chest is so secured upon the back of the cylinder that (1) it is free to follow any changes in shape due to fluctuations in temperature, and (2) it can be so surrounded by the cooling water that no excessive rise of temperature can take place. By this means all splitting of the valve chest is said to be prevented.

Supplying Gas, Vapour, or Air (or Mixtures thereof) for Combustion.—Scott-Snell, C., of Victoria Street, S.W. No. 610; Jan. 9, 1904.

This invention relates to the supply of gas or air under pressure, or a mixture of the two under more or less pressure, for the purpose of lighting or heating by combustion. It has for its object "to provide conveniently for the improved combustion which results through more perfect mixing attained by the supply of the gas or air under pressure, or through the supply of a non-self-burning mixture of gas and air, which becomes mixed with further air at the point at which it is utilized."

The invention consists: (1) In an improved form of compressing apparatus, in which a reciprocating compressor, formed by either a single or double acting bell or diaphragm pump, is driven from a motor through a spring motor. (2) In employing a mechanical or electrical switching device, adapted to bring the external motor into operation when the spring motor becomes run down below a predetermined point, or cut out the external motor when the spring becomes wound above a second predetermined point—as, for example, when the demand for gas stops, so that the apparatus may supply gas automatically on demand. (3) In a method of obtaining a supply of a non-self-burning mixture of gas or vapour and air for delivery to a distribution system, consisting in opening the reciprocating compressor to the gas supply and to the air for the required times in succession during each suction stroke—the mixing thus taking place in the compressor itself.

Support for Incandescent Mantles.—Taylor, J., of Bacup. No. 859; Jan. 13, 1904.

This invention relates to means for supporting incandescent mantles on gas-burners, whereby the weight of the mantle is distributed more evenly over a larger surface placed under the shoulders of the mantle, instead of being merely suspended on the ordinary fork or prop. The support consists in the combination of a ring formed to fit under the curved shoulder of the mantle so as to support it, and either provided with a cross bar having two holes to receive the forked end of the ordinary support, or with the support forked at the top and made in one piece with the ring.

Treating Coal Gas and other Gases containing Ammonia and Cyanogen for the Extraction of Ammonia and Cyanogen therefrom, and the Partial Regeneration of the Agents employed in the Extraction.—Feld, W., of Hönningen-on-Rhine, Germany. No. 966; Jan. 14, 1904.

Hitherto gases containing ammonia and hydrocyanic acid have been treated (says the patentee) with iron compounds in such proportions that all, or nearly all, of the hydrocyanic acid present has been absorbed, but only part of the ammonia present in the gas has been absorbed in forming soluble and insoluble compounds of ammonia with iron and cyanogen—the ammonia in the gas acting as an alkaline absorbing agent. By these processes, the ammonia is recovered in four different compounds, and two different apparatus or operations are required—one for the recovery of cyanogen, and the other for the recovery of ammonia. Furthermore, by the influence of free ammonia and of basic ammonia compounds (carbonate, sulphide, and cyanide), part of the cyanogen is lost by the formation of sulpho-cyanide, especially in dealing with gases containing oxygen and sulphuretted hydrogen, such as the gases from coking-ovens and blast-furnaces.

The process, according to the present invention, has for its object to enable practically the whole of the ammonia and hydrocyanic acid present in the gases to be recovered in one operation and to avoid the formation of sulphocyanides, by neutralizing the whole of the free ammonia and the basic ammonia compounds and forming neutral salts of ammonia, and by absorbing the whole of the hydrocyanic acid in the same solution—forming an iron cyanogen compound free from ammonia.

For this purpose, the gases are treated with a solution containing an iron compound or compounds (especially ferrous compounds), together with salts, as hereafter explained, in such proportion that for each six molecules of cyanogen in the gas, at least one atom of iron is used, and for each molecule of ammonia in the gas there is used at least one non-atomic equivalent of a salt which will be decomposed by free ammonia alone, or by ammonia in the presence of carbonic acid, sulphuretted hydrogen, or hydrocyanic acid, in yielding the corresponding neutral ammonia salt and the basic compound of the metal of the salt used. These salts are the acid and neutral salts of non-basic reaction of the alkalies, earth alkalies, and magnesia, and of those metallic earths and metals which are decomposed by basic ammonia compounds (ammonium-hydroxide, ammonium-carbonate, ammonium-sulphide, and cyanide). The following is an example of the reaction with an alkali salt:

$$(1)\quad (NH_4)_2CO_3 + 2\,NaCl = 2\,NH_4Cl + Na_2CO_3,$$

and the following are examples of reactions with metal salts:

$$(2a)\quad 2\,NH_3 + MnSO_4 + 2\,H_2O = (NH_4)_2SO_4 + Mn\,(OH)_2.$$

$$(2b)\quad (NH_4)_2S + MnSO_4 = (NH_4)_2SO_4 + MnS.$$

The patentee has found the haloid salts of the bases to be very suitable for the purposes of his invention, and also the sulphates, sulphites, phosphates, and the like.

To absorb the whole of the cyanogen in the gas, it is necessary for the gas to contain at least four molecular proportions of ammonia and six molecular proportions of hydrocyanic acid, if a basic iron compound, such as iron-hydroxide or iron-carbonate, be used, together with the salt according to the following equation:

$$(3)\quad 4\,NH_3 + 6\,HCN + Fe\,(OH)_2 + 2\,MgCl_2 = Mg_2FeCy_6 + 4\,NH_4Cl + 2\,H_2O.$$

If a neutral iron compound be used, there must be six molecular proportions of ammonia and six molecular proportions of cyanogen according to the following equation:

$$(4)\quad 6\,NH_3 + 6\,HCN + FeSO_4 + 2\,MgCl_2 = Mg_2FeCy_6 + 4\,NH_4Cl + (NH_4)_2SO_4.$$

If there be less ammonia in the gas, ammonia must be added to it, or ammonia, and also an equivalent of another basic matter, may be introduced with the salt solution.

The additional ammonia required may be added to the gas before washing it, or to the solution used for washing. There may also be added, to the absorbing solution, another basic compound capable of expelling ammonia from ammonia salts when heated with them—such as the hydrates, carbonates, and sulphides of the alkalies, or earth alkalies, or magnesia.

If there be more ammonia than the equivalent of the hydrocyanic acid, the ammonia will be absorbed by decomposition of the salt used if this be a salt of metal, or of a metallic earth, according to the foregoing equations 2^a 2^b; and, if a salt of an alkali, an earth alkali, or of magnesia, be used, the excess of ammonia will be absorbed by the simultaneous reaction of the salt and the carbonic acid in the gas upon the ammonia according to the following equation:

$$(5)\quad 2\,NH_3 + MgCl_2 + CO_2 + H_2O = MgCO_3 + 2\,NH_4Cl.$$

Should there be less carbonic acid in the gas than is equivalent to the excess of ammonia, then carbonic acid gas, or gases containing carbonic acid, may be added to the gas, or the salt solution may be treated with carbonic acid, or a bicarbonate may be added to the salt solution:

$$(6)\quad 2\,NH_3 + MgCl_2 + Mg\,(HCO_3)_2 = 2\,MgCO_3 + 2\,NH_4Cl.$$

In any case, besides the iron compound equivalent to the hydrocyanic acid, so much of the other salt must be used that the whole of the ammonia is absorbed to form a neutral salt. An excess of the iron compound, or of the salt, or of carbonic acid is not objectionable.

The solution, after having been used for washing the gases, contains, in the form of a neutral salt, all the ammonia of the gas treated; and it also contains iron-cyanogen compounds and (according to the nature of the salt used) the insoluble, or soluble, hydrates or carbonates, or, if metallic salts have been used, and sulphuretted hydrogen was in the gas, sulphides of the metal of the salt.

If alkaline, earth alkaline, or magnesian salts have been employed, the salts are regenerated by boiling the solution used after adding the hydrate, or carbonate, of an alkali, earth alkali, or magnesia. The following reaction occurs:

$$(7)\quad 2\,NH_4Cl + MgO = MgCl_2 + 2\,NH_3 + H_2O.$$

The salt (in this case the magnesia salt) is regenerated and the ammonia is distilled off.

If there should be as much carbonate of an alkali, of an earth alkali, or of magnesia in the sludge as is necessary for the decomposition of the ammonia salt, the addition of a basic compound for the distillation is not necessary, but it is not objectionable.

After distillation, the solution is free from ammonia, and can be used again after adding an iron compound, even if some of the ammonia salt should remain. This may be the case if carbonate of lime was used for the distillation. In this case, some fresh salt must be added before re-using the solution. It is not necessary to cool the solution before

re-using it, as a solution at a temperature of from 30° to 70° C. gives a purer ammonia salt than does a cold solution, which might absorb traces of sulphuretted hydrogen. For this reason, it is preferable to treat the gases with the solution before they are cooled below 30° C. According to the concentration of the solution, the insoluble compounds are, from time to time, filtered off, if necessary (after precipitating the ferrocyanide), by adding an iron compound. Thus the cyanide is obtained as Prussian blue, or as an insoluble alkali, earth alkali, or magnesia, ferrocyanide, such as calcium-iron-ferrocyanide ($CaFe_2Cy_6$), or, if ammonia salts were in the solution, as calcium-ammonium-iron-ferrocyanide.

Suitable salts for use in conjunction with an iron compound, in carrying out this invention, are acid (and neutral) salts of a non-basic character, such as the haloid salts, the sulphates, the sulphites, the phosphates, and similar salts of an alkali, of an earth alkali, of magnesia, of the metallic earths, or of the metals—alone or mixed together.

For further explaining the invention, the patentee gives the following example of a way in which it may be performed, using, as absorbing means for washing the gas, a mixture of calcium chloride and ferrous sulphate. From the waste liquors resulting in the process, the calcium chloride used may be recovered.

Example.

Let it be supposed that the coal gas to be treated is of normal composition, containing in 100 cubic metres about 2000 grammes of carbon dioxide, 1500 grammes of sulphuretted hydrogen, 340 grammes of ammonia, and 156 grammes of hydrocyanic acid. Such coal gas shows the ratio of 6 molecular proportions of hydrocyanic acid to 20 molecular proportions of ammonia and 45 molecular proportions of carbon dioxide. For absorbing the amount of ammonia present in the gas, 10 molecular proportions of calcium chloride are required—bearing in mind that it is preferable to use a slight excess of calcium chloride. For absorbing the hydrocyanic acid present in the gas, one molecule of a bivalent ferrous compound in required. When calcium chloride and ferrous sulphate are used for washing the gas, the following reactions will occur:

$$(8a)\ 6\ NH_3 + 6\ HCN + 3\ CaCl_2 + FeSO_4 = Ca_2Fe\ (CN)_6 + 6\ NH_4Cl + CaSO_4$$

$$(8b)\ 14\ NH_3 + 7\ CO_2 + 7\ CaCl_2 + 2\ OH_2O = 14\ NH_4Cl + 7\ CaCO_3 + 13\ H_2O$$

$$\text{or } (8)\ 20\ NH_3 + 6\ HCN + 7\ CO_2 + 10\ CaCl_2 + FeSO_4 + 20H_2O = Ca_2Fe\ (CN)_6 + 20\ NH_4Cl + 7\ CaCO_3 + CaSO_4 + 13\ H_2O$$

In order to recover the whole of the ammonia and of the hydrocyanic acid present in 100 cubic metres of the gas mentioned, at least 280 grammes of ferrous sulphate ($FeSO_4$, $7H_2O$) and from 1000 to 1300 grammes of calcium chloride are required.

Having ascertained the amount of the compounds present in the gas, the amount of the chemicals necessary for washing the gas is calculated according to the above equations 8^a, 8^b, and 8, and then this calculated quantity of the chemicals (according to the present example 280 grammes of ferrous sulphate ($FeSO_4$, $7H_2O$) and from 1000 to 1300 grammes of calcium chloride) is dissolved in water. It is well to prepare a solution of such a concentration that there is obtained, after having finished the washing process, a solution containing about 5 per cent. of ammonia (in the form of ammonium chloride). For this purpose, about 7 litres of water are required for the above-mentioned quantity of absorbing substances.

After the washing process is finished, there remains in the washer a solution or sludge, with a faint odour of coal gas. The solution is practically free from sulpheretted hydrogen, which is not soluble in the solution, and the solution contains about 4 per cent. of calcium ferrocyanide (Ca_2FeCy_6), 15 per cent. of ammonium chloride (NH_4Cl), 10 per cent. of calcium carbonate ($CaCO_3$), and 1·5 per cent. of calcium sulphate ($CaSO_4$); the two last-named compounds being mostly undissolved. If an excess of iron compounds be used, the cyanogen will be precipitated as insoluble calcium-ammonium-iron-ferrocyanide, or as ferrous cyanide, but some of the iron is present as sulphide of iron according to the amount of the excess used. The sludge coming from the washer is then heated in order to distil off the ammonia and to regenerate the salt used for its absorption. Before, or during, the heating process, calcium hydroxide is added, the quantity of which is indicated by the following equation:

$$(9)\ 20\ NH_4Cl + 7\ CaCO_3 + 7\ Ca\ (OH)_2 = 10\ CaCl_2 + 4\ CaCO_3 + 20\ NH_3 + 3\ CO_2 + 17\ H_2O$$

From the mass thus freed from ammonia, the cyanogen compounds may be separated, if the solution be of suitable concentration (obtained by evaporating the water, or by using the mass several times for washing the gases), by adding a suitable iron compound—for instance, a ferric or a ferrous compound—by which the cyanogen is precipitated in the form of Prussian blue or calcium-iron-ferrocyanide. The obtained precipitate may be separated from the solution by filtering, or decantation, or the like.

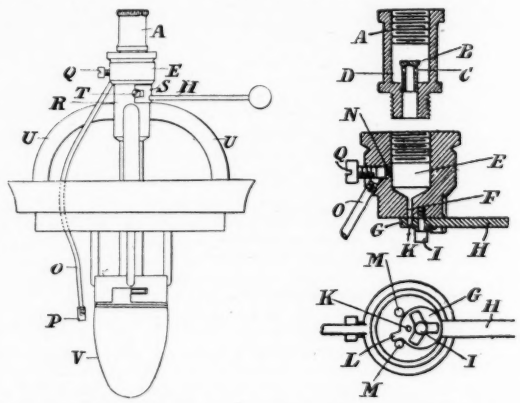
If the cyanogen be obtained in the form of insoluble compounds in the sludge coming from the washer or scrubber, it may be separated from the ammonia liquor by filtration before heating and distilling off the ammonia. After the ammonia has been distilled off, and the calcium chloride has been regenerated by the distilling process, the warm solution may be used for another washing operation, after having added the iron compounds necessary for absorbing the hydrocyanic acid in the gas to be treated.

It is found that the warmer the liquor containing the absorbing substances is during the washing operation, the purer will be the solution of ammonia salt and of ferrocyanide resulting from the process. A temperature of from 30° to 60° C. is very suitable for the purposes; ammonium sulphide being dissociated at above 30° C. Therefore, with a liquid of 30° C. and higher, no ammonium sulphide, no polysulphide, and no sulphocyanide can be formed. It is therefore preferable to wash the gas before it has been cooled below 30° C. in order to diminish or to avoid the formation of sulphocyanide compounds in the gas before it comes into contact with the washing solution. The recovery of the ammonia and cyanogen can, however, be effected even if the gas be washed with the mixture of iron compounds and the salts at temperatures below 30° C.

Inverted Gas-Burners.—Altman, J.; a communication from the Continental-Gesellschaft für nach unter Brennendes Gas-Glühlicht m.b.h. of Berlin. No. 14,976; July 4, 1904.

This invention relating to inverted incandescent gas-burners, has for its object an improved gas-regulator and bye-pass arrangement and a device for arresting solid particles which may be entering the burner with the incoming gas. The arrangement is described as applied to the burner referred to in patent No. 5977 of 1903.

The gas on entering the burner passes into the thimble A, in the centre of which is fixed a small cap B, under the head of which are holes C. An annular space D is left around the cap below the holes. As gas passes through this device, practically all dust and solid matters are deposited in the annular space D, while the gas entering through the holes C passes in a clean condition into the burner.



The gas entering the burner flows through the socket E and out at the base through the perforation F. On the base of the part E is pivoted a disc G, preferably formed in one with a regulating handle H; the disc being pivoted at I and having a hole K through it adapted, in one position, to register with the perforation F. The disc is limited in its movement by a projection L working between two stop pins M. A bye-pass N leads out from the socket E above the gas-regulator and communicates with a tube O of well-known form, at the end of which P is a bye-pass jet-burner. The amount of gas allowed to pass through the passage N and tube O is regulated by a screw Q.

The socket E rests in the upper tube of the burner R; and the handle H, projecting through a cut-away part of the tube, carries with it a sliding-plate S, the ends of which are slotted and slide under the heads of screws T.

APPLICATIONS FOR LETTERS PATENT.

26,431.—Burt, P., "Gas-engines." Dec. 5.
26,433.—Soper, H. E., "Gas-engines." Dec. 5.
26,442.—Herrick, J. A., "Gas producers." Dec. 5.
26,443.—Goodridge, R. H., and Tait, A. W., "Incandescent burners." Dec. 5.
26,493.—The Chalk Power-Gas Syndicate, Ltd., and Pearson, R., "Concurrent production of fuel gas and lime." Dec. 5.
26,501.—Strutt, J. W., "Enclosed gas-light." Dec. 6.
26,503.—Crossley, W. J., and Atkinson, J., "Internal combustion engines." Dec. 6.
26,550.—Krimer, M. L., Cutajar, H., and Bayley, P. & E. W., "Portable gas cooking-stoves." Dec. 6.
26,552.—Biheller, S., "Gas-lanterns." Dec. 6.
26,680.—Bruce, J. L., "Automatically lighting and extinguishing gas-lamps from a distance." Dec. 7.
26,697.—Richmond, J. A., "Dust-interceptors and governors for gas-burners." Dec. 7.
26,721.—Harper, H., "Incandescent burners." Dec. 8.
26,729.—Horton, W., "Anti-vibrator." Dec. 8.
26,747.—Bamlett, A. C., "Manufacture of asphalte and tar macadam." Dec. 8.
26,754.—Harvey, F. C. R., "Incandescent burner." Dec. 8.
26,770.—Fleischer, E., "Power gas." Dec. 8.
26,837.—Whalley, J., "Incandescent burners." Dec. 9.
26,838.—Johnson, W., "Gas-cookers." Dec. 9.
26,879.—Williams, P. E., "Purifying gas." Dec. 9.
26,892.—Fowler, C., "Carburizing air." Dec. 9.
26,907.—Compagnie Anonyme Continentale pour la Fabrication des Compteurs à Gaz et autres Appareils, "Discharging gas-retorts." Dec. 9.
26,939.—Planet Foundry Company, Ltd., and Calderwood, G. F., "Gas-fires." Dec. 10.
26,990.—Melhuish, A. G., "High-pressure burners." Dec. 10.
27,006.—Deimel, F., "Automatic igniters." Dec. 10.

Incandescent Gas Lighting for Battersea.—The Battersea Borough Council considered, on Wednesday, an offer from the Wandsworth and Putney Gas Company to convert the 48 public street-lamps in their district to the incandescent system, at a net cost of 11s. per lamp, and afterwards to reduce the charge for maintenance and lighting from £3 4s. to £2 16s. per lamp per annum. It was unanimously decided to accept the offer, except in respect to seven lamps in York Road, which are to be lighted with electricity.

MISCELLANEOUS NEWS.

CONTINENTAL UNION GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Tuesday, at the London Offices, No. 7, Drapers' Gardens, Throgmorton Street, E.C.—Mr. ARTHUR LUCAS in the chair.

The SECRETARY (Mr. W. Martin) read the notice convening the meeting, and also the following

REPORT OF THE DIRECTORS.

The Directors have to report that at Messina and Montargis—the two stations owned by the Continental Union Gas Company, Limited—the increase in the number of consumers has been 7 per cent. The quantity of gas sold shows an increase equal to 2½ per cent. over last year.

The net sum spent on capital account at these two stations amounts to £1890; being for a distillery boiler, new store, and additional columns to a gasholder at Messina, and mains, lamps, and services at both stations.

The net profits at these two stations show an increase of £982, mainly due to the increase in the sales of gas at Messina and a decrease in the price of coal.

Allusion was made at the last meeting by the Chairman to the amount due to the Company by the Town of Messina for public lighting. In consequence of strong representations made to the authorities by one of the Directors, who visited that city in the spring, an immediate payment was made of £2330 on account. A further payment of £5780 has lately been made—thus reducing the amount owing on the 30th of June last to £20,380. Negotiations are still proceeding for the settlement of this balance, and the regular payment for future supplies of gas.

With regard to the Union des Gaz, the total debited by that Company to capital account for work completed during the year amounts to £156,931. This includes purchase of land at Cette, new tank and gasholder, new batteries of horizontal retorts, purifiers, washer, condenser, &c., at Genoa, purchase of land and houses, new boiler, condenser, exhauster pumps, &c., at Milan, an entirely new works at Nanterre, with a leading main to the old works at Rueil, and new mains, lamps, and services at the stations generally.

The average price of the coal distilled has again decreased by about 1½d. per ton; but, on the other hand, the net price secured for coke sold shows a further fall of about 11d. per ton. Tar, however, shows a small increase in the price per ton.

The number of public lamps shows an increase of 663. The private consumers have increased by 14,157; making a total number of 184,564 consumers supplied by that Company. The total quantity of gas sold amounts to 91,845,000 cubic metres; being an increase over last year equal to 5½ per cent.

Owing to the continued increase of interest and amortization on their bond debt, due to the necessary expenditure on capital account, increase of working expenses, and a further reduction in the price of coke, the Union des Gaz have reduced their dividend by ½ per cent. This reduction has had a corresponding effect on the total profits of the Continental Union Gas Company, Limited, which for the year ending June 30 last amounted to £64,471 6s. 11d.

After adding a further sum of £3000 to the reserve, and writing down to their present value—to the extent of £1065 13s. 9d.—the investments in Consols and Local Loans, the Directors recommend paying a dividend for the year of 6½ per cent. on the ordinary stock, free of tax, and of 7 per cent. on the preference stock, less tax. Deducting the interim dividend paid in July last, and paying the balance 3½ per cent. on both the ordinary and preference stocks, the amount carried forward to profit and loss new account will be £9367 13s. 3d. It is proposed to pay the dividend as usual on the 4th of January next.

The Directors regret to report the resignation of their esteemed colleague, Mr. John Horsley Palmer, who, on succeeding to the chairmanship of the Imperial Continental Gas Association, found it impossible to give the necessary attention to the affairs of this Company. Mr. John Henry Birchenough has been elected to fill the vacant seat at the Board.

The late Secretary of the Company, Mr. F. W. Himing, having completed 40 years' service with the Company, tendered his resignation in January last. Mr. William Martin, the Assistant-Secretary, has been appointed to fill the office rendered vacant by Mr. Himing's resignation.

The Director who retires by rotation is N. E. B. Garey, Esq., and the Auditors, A. T. Eastman, Esq., and C. P. Crookenden, Esq., also retire—all of whom, being eligible, offer themselves for re-election.

ADMINISTRATIVE CHANGES.

The CHAIRMAN said, before dealing with the business of the day, he wished to say a few words about the changes in the directorate of the Company as mentioned in the report. Mr. Horsley Palmer found, on succeeding to the chairmanship of the Imperial Continental Gas Association, that the duties of the chairmanship of two gas undertakings (for he was Chairman also of the British Gaslight Company) prevented his giving the necessary time and attention to the affairs of this Company. He therefore placed his resignation in the hands of the Board. After asking him to reconsider his decision, and his declining to do so, his colleagues were, with much regret, compelled to accept it; and they had elected Mr. John Henry Birchenough to the vacant seat on the Board. Mr. Birchenough's intimate knowledge of the working of foreign gas undertakings (for he is a Director of the Imperial Continental Gas Association and the Danish Gas Company) fully qualified him for the post; and the Continental Union Company were to be congratulated on having secured his services. Many of the proprietors had long been acquainted with Mr. Himing, the late Secretary, who, after forty years of hard work in the service of the Company, felt that the time had arrived for him to retire, and enjoy life more easily. The Directors had accepted his resignation; and he (the Chairman) wished to avail himself of this opportunity to express to the proprietors' their appreciation of Mr. Himing's long and devoted services, and the hope that he would live long to enjoy the retiring allowance which he had so well earned. They had appointed to the vacant post Mr. Martin, who had been thirty-eight years in the Company's service, and for a long time Assistant-Secretary. The proprietors would be glad to hear that Mr. Tendron's long illness had at last taken a favourable turn; and they might fairly hope that their Deputy-Chairman would soon be restored to health and strength. He (the Chairman) was indeed happy to be able to report that only that morning, he had a telephonic message to say that Mr. Tendron was going on very well; and also a letter from him in which he said how much he regretted that he could not be present that day.

FINANCIAL QUESTIONS.

As perhaps some new shareholders might be present who were unacquainted with the affairs of the Company, and it might be desirable to refresh the memories of the older shareholders, he proposed to explain generally the position of the Company, and its relation to the Union des Gaz. The capital of the Company, as the proprietors were aware, was £800,000 in ordinary shares, and £200,000 in 7 per cent. preference shares. The Company owned and worked two stations—Messina and Montargis; but the bulk of the capital was invested in the shares and bonds of the Union des Gaz. To be exact, they held 36,900 of the 50,000 shares of the French Company, whose capital was £1,000,000, and in addition they had £57,882 invested in their bonds—the total amount of these bonds being £1,326,463. The proprietors would at once, after this statement, realize how almost entirely the Company's welfare depended on that of the French Company. Before, however, alluding in detail to the affairs of the Union, he would deal with the accounts which they had before them. Turning to the profit and loss account, it would be seen that the profit for the year was £64,471, which was £3047 less than last year. This diminution was due entirely to the reduction of the Union des Gaz dividend, the causes of which he would refer to later on. In view of the lessening of the profits, the Directors deemed it advisable to recommend a final dividend of 3½ per cent.—making, with the interim dividend, a total of 6½ per cent. for the year. It was with great regret that they recommended the reduction—a small one it was true, but still a reduction. But, having anxiously considered the present state of affairs, and the future prospects of the Company, the Directors deemed it advisable to take the only course they felt justified in recommending—that was, to reduce the dividend ½ per cent. He must also call attention to the figures in the balance-sheet under the head of investments on account of reserve fund. A sum of £3000 had been added to the fund, which now stood at £39,626—an amount which he hoped would be increased. The investments of the fund in Local Loans and Consols had been written down to their approximate market value—a course which, he was sure, the proprietors would approve of. At Messina and Montargis—the two stations belonging to the Company—the increase of the business, and the resultant profits, was satisfactory. Last year he said that there was little doubt that the business would improve; and it had, as was seen by the report. He alluded also last year to the municipal debt to the Company at Messina, which he hoped would before this have been settled. They had constantly pressed for payment; and in March last Mr. Hesketh Jones, with the late Secretary, visited Messina. But, prior to their arrival, the Mayor and his Council had been superseded by a Royal Commissioner. Negotiations were at once entered into with that official, resulting in a payment on account. In October, a new Council was elected; and after much pressure a further instalment was received. On June 30, £26,160 was the amount of the debt; and £20,380 was still due to the Company. As the report stated, negotiations were proceeding; and the proprietors might rest assured that the Directors would assert the Company's rights by all legal means for payment of this large amount.

THE CAUSES ADVERSELY AFFECTING PROSPERITY.

He would now refer to the affairs of the Union des Gaz. As he had said, the reduction of the dividend by ½ per cent. was due to a corresponding reduction in the French Company's dividend. Now it might reasonably be asked why, with an increase of 5½ per cent. in the gas sold, there was a diminution in the profits. To explain this, he must, to a certain extent, repeat what he said to the proprietors last year, for the chief causes which adversely affected the prosperity of the French Company had existed during the year under review. As the proprietors no doubt were aware, the Company always looked to coke sales as the most profitable source of income. Now, the fall in the selling price of coke during the past year had been remarkable. In Italy, it amounted to 2 frs. per ton, and altogether £8000 less had been received for this residual. This drop was partly due to the series of mild winters that had prevailed for some years, but also to the sale in Northern Italy of large quantities of coke exported from France and Germany. Last year he hoped that this fall in prices had ceased. But this had not been the case; and the proprietors must bear in mind that these fluctuations of the coke market were quite out of their control.

Now, with regard to capital expenditure. The great and rapid increase of the population of Milan and Genoa, and the consequent strain on the gas-works of these towns, had necessitated their enlargement and improvement. At Milan, new benches of the most modern design had been constructed; and the Directors naturally expected great economy by the promised reductions in manual labour. Unfortunately, these expectations had only partially been realized. As the differences with one of the Contractors who built some of these benches would have to be settled in a Court of Justice, he was precluded that day from going into the matter. In addition to these new benches, the rapid increase in the demand for gas—the rate of increase was 10 per cent.—would, in the immediate future, necessitate a very large expenditure At Genoa new works on a new site would have to be constructed, as the demand for gas was completely out-stripping the producing power of the existing works—in fact, the Company were suffering from their increase in business. Altogether £158,402 was spent last year in enlargements and improvements. To meet this capital expenditure, £150,000 had been raised by issuing 4 per cent. bonds; and this issue of bonds would have to continue. The increase of interest on these bonds was £7800, and was another of the causes of the diminution of profits. With the increased business, they had had, of course, to export more coal, with a corresponding increase of the tax. They now paid to the State no less than £13,589 a year, or £1·36 per cent. on the capital; while in former years they were, of course, free from this drain on their income.

LABOUR TROUBLES.

The next and very important cause of reduction in profits was the state of unrest among the working classes in Italy generally, and their

own in particular. He must take the proprietors back to 1901. In that year they concluded a treaty with the men, which was signed in Milan, and approved not only by the delegates of the men, but also by the representatives of the Municipal and State Authorities. By that treaty, very liberal concessions, were granted to all classes of the men employed by the Company in the cities of Milan, Genoa, Alessandria, and Modena. The increase in pay alone involved an immediate extra expenditure of £15,000 a year; and last year the increase was £6000. Not only were the wages increased, but the hours of work were reduced; and a scheme of pensions was framed which guaranteed pensions to all the men and their widows. These pensions cost the Company £3000 more last year than in 1902. There were many other concessions in the treaty which it would take too long to then explain to the proprietors. Suffice it to say that, when it was signed, the Directors were justified in believing that the men would, for some time at least, settle down to their work. All went well until the beginning of this year, when the influence of Socialist leaders not only induced the workmen, but also the clerks who had benefited by the treaty, to throw over their delegates of 1901, and, forming themselves into a league, make entirely new, and in many instances impossible, demands. Then ensued the events of September, when, as the proprietors would remember, a general strike was proclaimed, which took place in many of the chief cities of Italy. Now they had all no doubt read in the newspapers about these labour troubles; but it would interest them to hear a detailed account of what occurred in the cities lighted by this and the French Company. In Milan for three nights, the great city was in total darkness. All the shops were closed, and the city was practically in the hands of the strikers; no assistance whatever being given either by the State or the Municipal Authorities. At Genoa, the Company were helped by the Authorities. Firemen acted as lamplighters; and soldiers and sailors were sent to the works. By their assistance, it was possible to supply the public and private lighting; but damage was done to the public lamps to the extent of £500—not a penny of which would be repaid to the Company. At Modena and Alessandria, the men went out for a short time only; and having a comparatively small number of them to deal with, the Managers were able to minimize the effects by inducing the men to remain at work. At Messina, he was glad to say, through the influence of the Manager, no strike took place—indeed, the Government so fully appreciated his efforts that they had decorated this gentleman, very much to the satisfaction of the Board, who felt that the honour was thoroughly well deserved. Indeed, great credit was due to the Managers of all the works in Italy for the conduct of their duties under very trying circumstances.

Now the proprietors would see that the losses to the Union des Gaz from these strikes were due to causes that had nothing to do with the affairs of that Company. But even these losses would not greatly have affected the Company if the men, during the past year, had been honest enough to give a fair day's work for the liberal wages they received. He would give in figures a proof that in Milan they did nothing of the kind. A stoker with modern appliances could carbonize about 9 tons of coal per day; and, in fact, in France the men did this. But in Milan, with exactly the same machinery, the stokers refused to carbonize more than 2 to 3 tons a day. What was to be done with such men? No wonder that there was a large increase during the past year under the head of salaries and wages. He wished it to be clearly understood that the French Board had ever been willing to meet the men, and agree to their just demands. In proof of this, there was the agreement of 1901; and the liberal concessions that were then granted. On the most burning questions, provided they were within the terms of the agreement, they had always proposed arbitration; and he was glad to see that at last the men were willing to accept this method of settling these unhappy disputes—disputes affecting adversely the interests of all concerned. It was a great satisfaction for the Directors (he was referring to the Continental Union Directors, who were also Directors of the Union des Gaz) to feel that, in these labour questions, as in all other matters, they were in complete accord with their French colleagues, and that the two Boards worked in perfect harmony. He hoped he had now shown how it was due to the business in Italy that the profits of the Union des Gaz had been so reduced. The reduction in the price of coke, the increase in salaries, wages, pensions, and interest, amounted to £24,800, which was equivalent to 2½ per cent. on the capital of the Company. Therefore the proprietors would see that, but for these losses in receipts and increase in expenditure, the results of the year would have been satisfactory. He must ask them to bear in mind that in Milan the price of gas was far lower than in most of the towns in Italy, and that by the contract on Jan. 1 next, the price would be further reduced. Now, considering this fact, the exceptionally onerous conditions of the contract, the difficulties with which they had to contend in the extensions of the works, and the troubles with the men—he said, notwithstanding all these adverse conditions, they had scrupulously carried out, both in the spirit and letter, the terms of the contract. They consequently had the right to expect the support of the Municipality of the city of Milan. Instead of support, that body, acting quite inconsistently with the interests of the gas consumers, had placed difficulties in their path; and when the general strike took place, did absolutely nothing in the way of assisting the Company. They now learned that the citizens of Milan had, by their votes, marked their disapproval of the late policy by electing other representatives pledged to the maintenance of law and order. He thought he had taken up enough of the proprietors' time; and he hoped that he had clearly explained matters to them. He had endeavoured, to the best of his ability, to do so in a way that they might be able to form their own opinion with regard to the future prospects. Personally, he was justified in hoping that if they could only obtain better prices for residuals, and with improved machinery, freedom from labour troubles, and with the same increase in gas sold, they would have fairly satisfactory returns at the end of the ensuing year. All they asked of the proprietors was to be convinced that the causes which had led to the shrinkage of the profits were beyond the control of the Board; and he trusted they would place the same confidence in the Directors in the future as in the past. He concluded by moving the adoption of the report.

Mr. N. B. Garey seconded the motion.

CRITICISMS BY SHAREHOLDERS.

Mr. E. Clark said he saw an antiquated system was still a prevalent one with the Company. He hoped the time was not far distant when the Directors would put the proprietors in possession of the figures of each year, so that, when they attended the meetings, anything they might say might be fair criticism on the events of the year. The proprietors had seen some changes during the past seven or eight years; and he considered the time had come when they should modernize their system in this respect. The Chairman had spoken of Grand Junction Water-Works shares, in which they had an investment to the extent of £5396. Grand Junction shares, as they all knew, had ceased to exist; and within the last week or two, they had had an allotment of water stock. In this respect, he thought the Chairman might at least have told them the number of shares that the sum named represented. Then there was another criticism with respect to the fund. The investment for reserve should be such that, in case of need, they would be always able to apply to it. Therefore he held that all investments for reserve fund should be immediately realizable. He saw the Board had invested in the Union des Gaz 4 per cent. bonds—probably rightly, as he had not in his mind what the Board had to guide them—a sum of £10,200. In other words, they had invested the fund practically in their own Company; so that it was not a reserve fund at all. They could not realize it, if anything went wrong with their affairs. As a man of considerable knowledge of City affairs, he contended that this was wrong. He should have liked to have heard from the Chairman something as to the state of their affairs since June last. On this point, he ventured to submit that the proprietors were at least entitled to the Chairman's personal views.

Mr. J. Horsley Palmer inquired if the law which was put into force in Italy some time ago with regard to the municipalization of companies' undertakings, like gas companies, had had any effect with regard to their own stations. Had the Municipalities of Milan, Genoa, or Messina any idea of purchasing the works under that law? It seemed to him, with regard to Milan, that it would be a very good thing to sell them.

Mr. H. D. Ellis asked whether, with the view of counteracting the domination of the workmen, the Board had to any extent introduced mechanical machinery at any of the stations.

Mr. I. A. Crookenden sought information as to the rate of dividend paid by the Union des Gaz. He understood the Chairman to explain that the Company's principal source of income was the dividend from the Union des Gaz; but he could not help feeling that a good many of the proprietors were much disappointed at the decision at which the Board had arrived, to reduce the rate of dividend. He believed the Chairman had said that it was reduced *pro rata* with the Union des Gaz. However, he thought the Board were really going a little too far in the matter of building up a reserve fund. He could not see what the reserve fund was for, because he gathered that three-quarters or four-fifths of their income depended upon the larger Company; and he supposed the larger Company had a reserve fund. Therefore, he could not see the necessity for their own Company also putting by one of any considerable amount. As to the question of circulating the accounts, he thought this had been before the Board on previous occasions; and they had always decided that it would be impolitic, placed as they were, to publish them; and, if he might say so, he quite fell in with that view. Any proprietor could call at the office and satisfy himself as to the items of the balance-sheet; and he hoped the Board would not depart from what they had hitherto decided. As to the investment in the Union des Gaz, he differed from the gentleman who spoke. He thought the money in the Union des Gaz bonds was quite as good there as anywhere else.

A VISIT TO MILAN, GENOA, AND NANTERRE.

Mr. Cave-Orme said it was well known, from what he said last year, that he looked with considerable apprehension on the fall in the profits of the Company during the last seven or eight years. He did not think any other company in a like condition had had to put up with anything of the same kind. Naturally, therefore, as a large shareholder—he was one of the largest, and had been so for seventeen years—he looked with some apprehension on the condition of affairs; and it was quite clear he was not alone in this. After some consideration regarding the Company's position, he had had an interview with the Chairman; and, after a conversation with him, he (Mr. Cave-Orme) undertook to go to the places which the Chairman said were the Company's critical stations, and to himself see what was done there, how it was done, and what was going to be done. Consequently, early in November, he went to Milan, Genoa, and Nanterre. In the first place, he must congratulate the Chairman upon the speech he had made, and in which he had clearly and lucidly set forth the state of affairs at Milan. Having been so recently in the city, he could endorse all that the Chairman had said; and he could also say this, that he was received there by the Manager, upon the Chairman's introduction, with every courtesy and kindness, and was shown by him everything that he possibly could show, with regard to the work of the Company and the conditions of Milan generally. Italy at the time was just in the throes of the political elections. Consequently, he arrived there at a very favourable moment for appreciating the conditions of the working classes. There was no doubt whatever, he thought, that, as the result of these elections, the Socialistic tendencies had been checked; and he had every reason to think, from what he had observed and heard, that the coming year would certainly show a very great improvement in the more settled condition of the working classes of Italy. They had had a check; and they seemed to have taken their check well. So far, this was to the Company's profit and advantage. Although it was very true that the prosperity of the Company, paradoxical as it might seem, was the reason why the dividends were reduced, this was not the only reason. He thought one might go a little further back. Of this he was convinced, that one of the reasons why they were now in such a state, financially and otherwise, was because (he said this advisedly) of the bad finance of the prosperous years of the Company. The years 1884 to 1892 were years when other methods of finance ought to have been instituted, and were not—and not only finance, but he thought that the administration probably was not of that economical and far-

seeing character that it ought to have been. He did not think that it required in those years geniuses to look forward a decade. It was quite apparent then that labour troubles were coming to a head in the immediate years. And he did think that the Board of those days ought to have been apprised of that knowledge, and to some extent have been prepared for it. This was the conclusion he had arrived at, observing the state of things now and the state of things which was the case years ago. In Milan no preparation was apparently made in those years for what was obviously coming—an enormous increase in the production and sale of gas, together with a reduction in its price. Consequently, when this took place, and a new concession had to be made, the Union des Gaz was in a somewhat difficult position. The same with Genoa. Genoa was a place that was rapidly growing even ten years ago. He remembered it then, and the other day he was shown how the town was enormously growing. People would have gas in these days and it had to be provided for. Yet in Genoa, there was only a tiny gas-works in the heart, or what would be the heart, of Genoa. They were unable to extend there, and unable to put in machinery. Yet it was only this last year that the Union des Gaz bought and for the purpose of new works. He merely said this to show that, in times of prosperity, opportunities that might have been seized were not seized; and this was one reason why they had to put up with these much reduced profits. Their business had increased two-fold; their profits had decreased one-half. This was an unprecedented state of things. He trusted that at last they had reached the bed-rock of the decline in their prosperity, and that the corner had been turned. Anyway, they were hoping to derive something good from those enormous sums of capital that had been poured into Milan during the last two or three years. He found a more gratifying state of things at Nanterre, where gas-works of the most modern type had been put up. Everything there was, of course, in a state of great efficiency; and, as they had heard from the Chairman, labour troubles did not obtain, because they heard that a man could carbonize at Nanterre something like 9 tons of coal a day, whereas, in Milan and Genoa, they could only get 2 or 3 tons a day out of them. The truth of the matter was that the workmen of Italy—who were a very generous people, if they were a little lazy sometimes—in years gone by did not trust the Company. They saw enormous dividends were taken; and there was no doubt the workmen of Italy were badly treated a few years ago. He did not say this Company were worse than any others; but there was the fact—it was so. What they had to do now was to get back, in some way or other, the confidence of these men. It ought to be done; and then they would find the men would produce better work for them. In regard to the matter of the new benches of retorts at Milan, it would be improper, of course, to refer to it at this meeting, as he understood it was the subject of legal proceedings; and the less said about it the better. He saw the benches there, and very good they were; and if the men could be induced to work them properly, they would produce a much better return than the former old style of working had done. Another thing which had been of great—extraordinarily great—importance to the Company had been the sale of coke at proper prices. When in Milan, he saw enormous quantities of coke; and, discussing the matter of its sale, it appeared that the coke there was almost more important than the gas. The price of gas in Milan now was 15 c. per cubic metre, which was something under 4s. per 1000 cubic feet—not very much greater than the price in part of London; yet Milan was a place where coal cost nearly twice as much. Therefore, the small profits from gas had to be made up from residuals. Of course, the Directors had no control over the market price—this was perfectly clear; and the only thing they could do was to get rid of it to the best advantage. It seemed to him a pity that the Company could not provide some other means of producing gas. There were other methods which would perhaps give the Company less of this particular residual to dispose of. At Milan, they were getting into competition in the matter of coke even with Paris; and, if this was the case, it did not look very bright for the Company. They would still have to dispose of the coke at a high price, in order to get the gas to pay. He did not wish to go into details more than was necessary. He thought he had said all he could that was of interest to the proprietors with regard to their most important towns. He had given his opinion that the sale of gas must progress at a very rapid rate, and must be provided for; and it must, he thought, yield more profit—certainly more than it had done in the past, if only they could, by their methods of administration, produce a better feeling among the men who had to do the actual work. Having also advocated the publication of the balance-sheet, he said it was a pity that, in the old and prosperous days, the proprietors were content to take their high dividends, and that there was no critic in those days to put a check on the distributions. One per cent. saved then, would have meant 2 or 3 per cent. to the proprietors now.

Mr. Crookenden thought he might say that the general opinion of the proprietors was that the Directors of the past had nothing to be ashamed of. He utterly dissented from the observations of the shareholder who had just spoken.

REPLY BY THE CHAIRMAN.

The Chairman said first, with regard to Mr. Clark and the vexed question of the circulation of the balance-sheet, it seemed there was almost a unanimity of opinion on this point among the proprietors. They knew it had been the practice with many of these foreign companies for purely political reasons not to publish their balance-sheets or reports in details; and they had only followed universal practice. But as the Board had reason to believe, from what had been stated that day and at previous meetings, there was a strong feeling that the accounts should be published, on the part of the Board he was ready to say that they should in future be placed in the hands of the proprietors. The reasons against this that obtained many years ago in these foreign gas companies did not obtain now; and therefore he thought that it was their duty, as the Directors were always anxious the proprietors should have full information, to give them, as they hoped to do in future, an early statement with regard to the accounts, together with the report. These would be put in their hands in proper time before the next meeting. Mr. Clark also remarked on the point of the number of shares held in the Grand Junction Water Company. The number was fifty-four; and they had, like the majority of people, taken a corresponding amount of water stock. Then Mr. Clark passed on to question the advisability of holding as a security the Union des Gaz bonds under the head of reserve fund. These bonds were perfectly negotiable securities; and, if they wished, they could the following day get the money for them. The bonds were continually being drawn; and therefore they might be put down as a liquid security. As to Mr. Clark's next remarks, he must take very strong exception to them, because Mr. Clark intimated that they had not posted the shareholders with regard to the facts up to date. He (the Chairman) could only deal with the figures in the accounts before them. He really could not go into figures that had not even come into the office from the various parts of the Continent. So far as the political position and labour affairs were concerned, he had given the information they possessed up to that very day. Could he possibly do more? Therefore he thought Mr. Clark's last remarks were unjustifiable. Regarding Mr. Horsley Palmer's question as to municipalization in Italy, they had not been approached in any way by any city. So far as the Board's knowledge of the subject went, they had no reason to think that any of the large cities of Italy had taken up municipalization either in connection with this or any other company. Then Mr. Ellis asked a question in regard to mechanical stoking. At their large stations they had put in the most modern appliances. They had done so at Nanterre, Milan, and Genoa. This was followed by a question by Mr. Crookenden as to the dividend of the Union des Gaz. For the past year, it was 8½ per cent., which was ½ per cent. less than it was for the previous year. Then Mr. Crookenden said something about the reserve fund being too high. He (the Chairman) could only say that, when last year he stated the amount of the reserve fund, and hoped it might be increased to at least £50,000, the observation was accepted very cordially by the proprietors then present. The proprietors must remember that the concerns they had to deal with at Montargis and Messina were terminable concessions; and they must provide for these, as they had nothing to do with the Union des Gaz. Then he came to the remarks of Mr. Cave-Orme. If he would permit him (the Chairman) to do so, he should like to take this opportunity of congratulating that gentleman most sincerely on the action he had taken. He was the only shareholder since he (the Chairman) had been in office who had taken the trouble to go round to the stations, and see personally for himself what was being done. He had come back fully impressed (he hoped Mr. Cave-Orme would correct him if he was wrong) that, so far as the Board were concerned, they were doing their best to struggle with a very difficult situation. He thought the proprietors would sympathize with him if he declined to go into the action of the Board of twenty years ago. It was no use crying over spilt milk. All he could say was that, as to the general policy of paying dividends up to the hilt, there could be no question; and he might go farther and say that, if this policy had been adopted in those days, they would have had an easier problem to solve now than they had. There was one error in Mr. Cave-Orme's description of the Genoa works. They had two large works at Genoa. One was named Sampierdarena and the other Bisagno. But the physical situation of Genoa was such that it was impossible to supply from the large works at Sampierdarena the new portion of Genoa which was being extended out to the north-east. There was an enormous mountain, of the very hardest stone, with one railway tunnel through it; and through this tunnel they had one gas-main passing. They could only do their best with such circumstances. But they could not struggle against the physical configuration of the country; and they would, for this reason, have to build a third works. On the difficult question of coke, the Board were fully cognizant of the advantages of making carburetted water gas. But unfortunately their knowledge was not shared by the municipalities of their various towns—especially in Italy; and they had met with unexpected difficulties whenever they had proposed to introduce water gas. He hoped that, with the increased prosperity of Italy, they might be able to maintain the price of coke. It had already gone up in Milan by 5 frs.; and if only the temperature would remain at a fairly low point, they would not do a bad business in coke. It was not a good thing to speak highly of one's own particular efforts; but he did not think that any Board in London could have been placed in a more difficult position than their own Board had been during the past twelve months. Here was a foreign Company, almost clashing with the political situation, and yet not liking to interfere with the politics, of the country in which they were working, yet invited to do so, and at the same time struggling with difficulties with their men, and with difficulties with manufacture. Therefore, he thought he might claim, under such peculiarly difficult circumstances, the proprietors' support, and this, he thought, they had a right to expect.

The motion was carried unanimously.

Proposed by the Chairman, and seconded by Mr. R. Hesketh Jones, the dividends mentioned in the report were declared.

On the motion of the Chairman, seconded by Mr. R. S. Gardiner, Mr. Garey was re-elected to his seat at the Board, and subsequently, on the proposition of Mr. Ellis, seconded by Mr. Clark, the Auditors (Messrs. Eastman and C. P. Crookenden) were reappointed.

The Chairman said his last resolution was that the thanks of the meeting be given to the Secretary and the Managers and Engineers of the stations of both their own Company and of the Union des Gaz. All the Managers of the works had done their duty well; and he would especially mention the Manager at Milan (M. Solanges) and at Genoa (Mr. Henry). Under the circumstances mentioned in his speech, they had behaved with extraordinary tact in dealing with difficult circumstances. The Managers at Alessandria, Modena, and Messina had also fully earned the gratitude of the proprietors.

Mr. R. Hesketh Jones seconded the motion; and it was heartily agreed to.

The Secretary expressed, in the names of the Managers abroad and of the late Secretary and himself, his sincere thanks for the vote.

Moved by Mr. Clark, and seconded by Mr. Cave-Orme, the Chairman and Directors were also cordially thanked for their services.

PUBLIC LIGHTING OF THE CITY OF LONDON.

Strong Testimony in Favour of High-Pressure Incandescent Gas.

At the Meeting of the Court of Common Council on Thursday, the Streets Committee brought up a report recommending that three 2000-candle power high-pressure incandescent gas-lamps (the Keith and Blackman Company's system) be placed respectively in Lower Thames Street, Queen Victoria Street, and Cannon Street, at an estimated cost of £300. Mr. A. C. Morton, the Chairman of the Committee, in moving the adoption of the recommendation, declared that high-pressure incandescent gas-lamps were superior to electricity, and also cheaper. Electric lighting in the City had not been a success, Paris and Berlin were giving up the light and adopting gas; and the results of experiments in London had conclusively proved that incandescent gas, under pressure, was the best and cheapest street lighting which could be obtained at present. The report and recommendation were agreed to.

TRADE DISPUTES AND COMBINATIONS.

The South Metropolitan Gas Company and their Workmen.

The Royal Commission on Trade Disputes and Trade Combinations, of which Sir Godfrey Lushington is President, held two meetings last week, at one of which Sir George Livesey was in attendance—a welcome return to public service after his serious illness—and gave evidence. He furnished particulars as to the arrangements made by the South Metropolitan Gas Company with their workmen, under which the men secure continuous employment. He said the Trade Unions objected to these agreements at first, but had now accepted the position, and the agreements were signed generally, even by Trade Union officials, though, as a matter of fact, most of their employees were non-Unionists. He explained the co-partnership or profit-sharing arrangements which had been entered into by the Company with their men. The bonus given last year amounted to £35,000, and the men had now invested in the Company £250,000, many individual workmen having more than £100 standing to their credit. He considered that, owing to the greater interest shown by the men in their work since these arrangements had been entered into, the giving of the bonus had caused no actual loss to the Company. He pointed out that the real object of picketing was intimidation. It was sheer hypocrisy to talk of peaceful picketing when the number of pickets was unlimited. In these days of newspapers, general and local, there was no necessity to beset the works and workmen where a strike had taken place for the purpose of peacefully obtaining or communicating information; but supposing this were allowed, not more than two persons ought to be permitted to attend for the purpose. As regards the law of conspiracy, he could not see how threatening to strike even with a malicious motive could be made illegal as "conspiracy." He considered that the Taff Vale decision should be maintained. All other organized bodies were, he said, responsible for the acts of their agents; and there was no reason or justice in the proposed exemption of Trade Unions. The Unions now being liable, one of the difficulties as to incorporation felt by the Royal Commission on Labour of 1892 had been removed. Members of a Trade Union suffered a great hardship under the existing law in being prohibited from bringing any action against the Union of which they were members. The funds of Trade Unions ought to be separated—the subscriptions of members for sick and superannuation purposes only then being protected.

CONSOLIDATION OF BOSTON (MASS.) GAS COMPANIES.

Report of Mr. C. J. Russell Humphreys.

In the "JOURNAL" for the 25th of October, it was stated that the Board of Gas and Electric Light Commissioners of Massachusetts had had under consideration the question of consolidating the eight Gas Companies supplying Boston, and that they were only awaiting a report by Mr. C. J. Russell Humphreys on the value of the undertakings to come to a decision on the matter. Mr. Humphreys received his instructions on the 20th of January last; and his report was issued a few weeks ago. The Commissioners specially directed his attention to the clause of the Act under which the valuations were to be made, which sets forth that the value is to be determined "without enhancement on account of the value of franchises or earning capacity, or on account of exclusive privileges derived from rights in the public streets or of goodwill." He therefore made his valuation on the basis of the replacement value of the properties—as nearly as possible as at the date of his instructions. For this reason, he did not value certain works in process of construction. In general explanation of his report, he says: "I have found the schedule of the properties of the Companies far from satisfactory as a basis upon which to make the appraisal called for by the Board. After the loss of much time in the endeavour to follow the arrangement of these schedules in making the valuation, I was compelled, in order to reach and present the results in a logical manner, to radically rearrange and correct the schedules, and to adopt, in reporting upon the various properties, a more uniform form than that suggested by the schedules originally. If the several Companies had listed their properties in systematic manner, and accompanied their schedules with plans of the items recorded, the time required for the work would have been materially shortened. In my valuation, I have not included the following items found in some of the Companies' schedules: Gas-making materials, residuals, cast-iron mains and fittings, wrought-iron pipes and fittings, and meters in stock, general supplies on hand, accounts and notes receivable, cash on hand, and taxes and insurance unexpired. My reason for not valuing these several items was that they were changing from day to day; and therefore had they been listed at different dates the result would have been of doubtful value. Street-main tools being generally in use in the streets, I have not included them in my valuation. Any exceptions to this rule are given in the reports proper. Stable equipments have been treated in like manner and for a similar reason."

There are eight separate reports—one for each Company—and they are accompanied by plans and specifications. Mr. Humphreys places the total value of the buildings and machinery of the Companies at $20,276,598; and the following table shows how it is made up.

Companies.	Buildings.	Machinery.	Mains, Meters, &c.	Totals
Bay State	$470,443	$551,415	$347,476	$1,369,534
Boston	1,645,983	1,694,655	3,129,473	6,470,111
Brookline	448,904	1,578,070	3,426,681	5,453,655
Dorchester . . .	113,478	87,405	1,235,422	1,436,308
Jamaica Plain . .	64,511	132,346	439,784	636,641
Mass. Pipeline . .	131,776	769,233	1,543,574	2,444,583
Roxbury	212,142	155,380	1,267,829	1,635,351
South Boston . . .	151,771	104,253	574,594	831,618
Totals	$3,239,008	$5,072,757	$11,964,833	$20,276,598

The total valuation of the buildings, machinery, and outlying works includes 10 per cent. for engineering and 5 per cent. interest during construction. The machinery reported for Brookline includes $633,704 worth of electrical plant. The column for mains includes also services and stoves. The Board employed experts to appraise the properties of the constituent Companies, and they now report the fair value of the real estate to be $2,782,375, and that of the buildings, machinery, &c., to be £20,276,598 additional, making a total valuation, irrespective of franchises, &c., of $23,058,973.

GAS EXPLOSIONS.

An explosion of gas which caused injury (in two cases we believe of a somewhat serious character) to seventeen people and extensive damage to property occurred about a quarter to two on Wednesday afternoon at the corner of Southampton Row and Cosmo Place, Holborn. It appears that a fitter and his "mate" in the employ of the Gaslight and Coke Company were engaged in fitting new outside lamps to the shop of Mr. F. W. Barber, a linendraper; and at the time of the accident they were employed in making a connection with a 1¼-inch service-pipe, which had been previously laid by the men of the Distribution Department. The service-pipe had been capped, ready for the fitters connected with the department which has control of direct business relations with the gas consumers. The men removed the cap, put in a T-piece, and were in the act of screwing up the connection, when, through some cause variously explained, but not yet adequately, sufficient gas escaped to overpower the men. When this happened, there was nobody present to stop the gas; and so it flowed out full bore from the unplugged end, and quickly charged the basement round the shop and the neighbouring hotel. The smell of gas soon warned those inside the premises as to what had happened; and Mr. Barber immediately tried to establish telephonic communication with the Gas Company. Failing in this, he set off in a cab for the Company's offices to report the matter. Directly after he started, however, there was a violent explosion, which had a most disastrous effect on the shop and the property in the immediate neighbourhood. Mr. F. W. Goodenough, the Chief Inspector, was soon on the scene of the accident, and all possible assistance was also rendered by Mr. G. F. L. Foulger, the Distributing Engineer, although the work was not being carried out by his department. Fortunately there is no fatality to report in connection with the occurrence. One police constable, however, had both legs broken, another his left leg, while several other persons sustained cuts and shock of a more or less severe nature. In all, 24 different properties were damaged—some very seriously; but the most explosive point was undoubtedly reached immediately below Mr. Barber's shop. Various theories are advanced as to how the gas became ignited; and the most popular with the newspapers appears to be the, of course, impossible one that the gas was ignited by the smouldering end of a cigarette or cigar. In the neighbouring hotel, and down through the basement, there are said to be many places at which the gas could have ignited; and, from the inspection made immediately after the explosion, no doubt the Company's officer's could dispose satisfactorily of the theory that the gas was fired from the outside. Of course, lighted matches may have been thrown down outside; but it seems rather more likely that the gas was ignited from the inside. The effects of the explosion on the neighbouring property, while disastrous, present some interesting phenomena. For example, a shop window some fifty yards away was blown out; while intervening shop windows were untouched. Again, in the hotel next door, scarcely a sound window was left; but there the effects were also most peculiar—windows being smashed and missed in a most irregular fashion.

Shortly before two o'clock last Friday morning, a serious gas explosion occurred at the George public-house, Bethnal Green Road, the effect of which was that all the front windows of the house were blown out, and Mr. Ball, the proprietor, and his wife were slightly injured. It is supposed that one of the gas-burners had been left on full. Another London public-house—the Streatham Park Tavern, occupied by Mr. G. Hewett—was the scene of a gas explosion the previous evening, which completely wrecked the billiard-room and the back part of the first floor, and severely damaged the rest of the house of ten rooms. The billiard marker sustained injuries from burns.

An extraordinary succession of gas explosions, resulting in the wrecking of the house of a man named Mills and other serious damage, has been reported from Holywood, County Down. The first mishap

occurred shortly after five o'clock last Wednesday evening, and between that hour and noon on Thursday there were three others. Tiles were blown out of the kitchen floor, the walls of the adjoining rooms were shattered, the ceiling was blown down, the gateway beside the house destroyed, and the adjoining road torn up for several yards. Fortunately no person was injured. Workmen were busily engaged all Thursday seeking the cause of the explosions.

SUFFOCATION BY COAL GAS.

At the Churchtown Police Station, Southport, last Wednesday, Mr. S. Brighouse, the County Coroner, held an inquest concerning the death of Mr. James Hunt, aged 79, a retired grocer, of 105, Cambridge Road, which occurred on the previous Monday. Benjamin Hunt, son of the deceased, said his father slept in a doubled-bedded room on the ground floor. On Thursday, the 8th inst., he retired to bed about nine o'clock. The bedroom had a low ceiling, and the fireplace had been papered up. A small gas-stove was in the room, and was used for heating purposes. It was attached to a gas-bracket, and stood on a table near the deceased's bed. It was customary to light it in the evening early, and put it out when Mrs. Hunt retired. On Thursday the stove was alight all day, in consequence of the cold weather. It remained alight through the night. On the morning of Friday, he went to the room and found his father in a deep sleep, from which he was unable to rouse him. His mother was apparently in a similar condition. As he detected a smell of gas from the stove, he opened the window and went for a doctor. His mother recovered at 6.30 p.m.; but his father remained unconscious, and died on Monday. The gas-stove was alight when he went in on the Friday morning. They had had it nearly three weeks. Dr. Popert stated that on the 9th inst. he was called in to see the deceased, and found him in bed insensible, and presenting all the appearance of poisoning by asphyxiation. He (witness) ascertained that the gas-stove had been used for heating the room during the whole night. There was no flue to the stove, which stood on a small table near the bed. The fumes escaped into the room, and, being inhaled by the deceased for many hours, were undoubtedly the cause of his death. The room was only 7 feet high, and the fireplace had been sealed up with brown paper. Though the small window had been open all night, this would only affect one end of the room. The actual cause of death was carbonic oxide poisoning. The Coroner remarked that the method employed for heating the room was a very dangerous one. Witness replied that it was extremely dangerous. Deceased's bed was between the window and the sealed-up fireplace. At one end of the room there was no ventilation. The Coroner said he thought gas stoves and fires were always objectionable. Witness said they were safe enough so long as there was an open flue whereby the fumes could escape or be carried out of the room. It was possible that some of the burners in the stove might not have been perfectly lit, and some blown out; or it was possible that the stove might have lit underneath. The Coroner said it was remarkable how people would block up windows and fireplaces in these enlightened days. They prefer a fœtid atmosphere, if it was slightly warmer, to fresh air, which was far more beneficial. The Jury returned a verdict of "Death from misadventure."

Last Thursday, Mr. A. H. Hebbert held an inquest at Bromsgrove touching the death of Jane Prosser, aged 83, a widow, residing at Daisy Bank, Stourbridge Road, whose body was on Tuesday afternoon found on the floor of her bedroom, death having apparently been caused by suffocation. The evidence of Miss Lucy Sanders, niece of deceased, was that Mrs. Prosser, at her own desire, lived alone, and did all her housework herself, although she was possessed of ample means. Witness visited her house on Wednesday afternoon. Hearing no reply to her knocks at the door, she summoned assistance, and an entrance to the house was effected. Two witnesses who were the first to enter deceased's bedroom stated that the smell of gas was very strong, and Mrs. Prosser lay on the floor having apparently fallen backwards in attempting to turn on a gas-tap which was connected with a small stove from which the gas was still escaping. Dr. Cocker attributed death to suffocation by coal gas, and said deceased had been dead some hours when found. The Jury returned a verdict of "Death from misadventure."

The Coroner for the South-Eastern Metropolitan District was last Friday informed of a remarkable case of alleged suicide. It appears that a young man named Joseph Young Chant, aged 28, living in Lansdowne Road, Old Charlton, went into the room of a laundry where he was employed, and, after wrapping himself in a travelling-rug, turned on the gas and suffocated himself by inhaling the fumes from a piece of tubing which was found near his mouth. He had been greatly depressed recently. In one of his pockets was a note stating that he did not want anyone to mourn for him.

The Rivington Arbitration Awards.—At the meeting of the Liverpool City Council last Wednesday, the Chairman of the Water Committee (Alderman Burgess), in moving the confirmation of the proceedings of the Water Committee, remarked that the first minute was a record, and merely a record, of the award of the Umpire in the case of the purchase-money and compensation for the acquisition from Mr. Lever of the property at Rivington. In view of an important decision arrived at by the Water Committee, he thought it would not be advisable to discuss the matter at this juncture. The resolution of the Committee was that the Town Clerk should be instructed to defend any proceedings to enforce the awards in the case of Mr. Lever, the Misses Salt, and Mr. Shaw, or to take steps to set aside the awards should it be considered advisable to do so. He added that the resolution had been carried unanimously in the Committee. After discussion, it was decided that the minute referring to the awards be not received.

STANDARDIZATION OF WATER PIPES AND FITTINGS.

In previous issues of the "JOURNAL" we have recorded the progress of the movement initiated by the Plumbers' Company to bring about the standardization of pipes and fittings used for the supply of water, so as to make them interchangeable throughout the country, and at the same time to improve their quality. It has the support of several influential bodies, including the British Association of Water-Works Engineers; and we learn that the Board of Trade, the Admiralty, and the Metropolitan Water Board approve of the proposal. In our issue for the 12th of July last we recorded that the Joint Committee of representatives who had taken up the subject had appointed three Sub-Committees to deal with different branches of it. The idea briefly is that all pipes and fittings, both lead and iron, shall be made to a standard size throughout the country. A water-tap, for instance, which can be used in London, will also fit in Sheffield, Leeds, Glasgow, or Edinburgh. Ball-valves will be similarly dealt with; and provision is made that they shall in future be composed of gun metal. The valves of fittings and all parts are interchangeable, and every flushing-cistern will have affixed to it a stop-tap which will prevent flooding. It has been decided that all classes of fittings must pass a weight test of 400 lbs. pressure per square inch. Not only will the water-fittings be standardized, but the metals of which they are made, and even the component parts. In order that the scheme shall not be departed from, a permanent Sub-Committee will inspect all new fittings and all inventions, so that they shall not get on the market unless they are standardized and approved for water purposes. Another Committee is at present dealing with the question of workmanship in connection with the registration and qualification of the men. Under the scheme, manufacturers will save largely, while householders will also reap benefit. It is estimated that the fittings of an ordinary house under the new system will not come to more than 4s., and larger houses 6s.; and this has to be spread over the life of the fittings, which is about 30 years.

SOUTHWARK AND VAUXHALL WATER COMPANY.

The Half-Yearly Ordinary General Meeting of this Company was held last Tuesday, at the Offices, Southwark Bridge Road—Alderman Sir HENRY E. KNIGHT presiding.

The SECRETARY (Mr. Montague Watts) read the notice convening the meeting, and the report of the Auditors. The Directors' report was taken as read.

The CHAIRMAN said they had met in circumstances of some difficulty, because it was not within the power of the Board to present a statement of accounts officially. The accounts, so far as the Company were concerned, had been perfected for some little time, and had been audited by their Auditors and approved by them. But, according to the Act of Parliament, it was also necessary that they should be audited by the Government Auditor, Mr. Stoneham; and this gentleman had not yet been able to perform the duty. Such an audit was essential on this occasion, because the monies out of which the dividend would be paid, which had been collected by the Water Board, could not be got until that Board were satisfied with regard to the balance of profits due to the Company for the three months to June 24 last. Until the accounts had been audited by the Government Auditor, they would not pay over that money; and so it was necessary to wait before proceeding in the ordinary way to declare a dividend. He could assure them, however, that the accounts as prepared—and he saw no reason why they should not be passed—would not only enable the Board to pay the maximum dividend to which the shareholders were entitled, but also to give them something in respect of back dividends. With regard to the items in dispute—at least, as to those which might be in dispute, because there was nothing in dispute at present so far as this Company were concerned, though the items had been in dispute in respect of other Companies—the principal one was the question of the increased value of the stock. He did not presume to give any opinion, because the matter would have to come before the proper tribunal; but he thought he might explain what the position was. The custom of the Company's Engineer, to which the Board saw no reason to object, on the occasion of each stocktaking, was to take the stock in hand at a low price—not at a price which was arrived at after a proper and strict valuation, but at a figure which he knew to be on the right side. Things had now altered. When they came to dispose of their business and had to hand over stock to a purchaser, then they naturally valued their stock closely. This had been done in their case; and he said that whatever was the amount by which the stock exceeded, when properly valued, the price put upon it when they merely valued it for their own purposes, was the amount which ought to be paid by the purchaser. He did not think there could be a shadow of doubt about this. He thought they might fairly assume that the decision must be in the Company's favour in this matter. The proposed dividend, to June 24 last, was spoken of in the report as "a final dividend." That was perfectly correct in one sense. It was a final dividend on trading; but there would be something else to come to the shareholders. It would be remembered that about £47,000 odd was kept back for contingencies which might arise, and to meet the expenses of winding up. So far as could be seen at present, the whole of that £47,000 would not be required. There would be left a few thousand pounds; and the sum, whatever it was, would be a parting gift, which would have to be sent to the shareholders after the Company's affairs had been settled. The Board were proceeding to distribute the compensation in accordance with the scheme. Replies were coming in to the circulars which had been sent out, and the Board would lose no time in dealing with the matter. It must be understood, however, that as each claim had to be gone into separately, there was an enormous amount of clerical work to be done by the Bank of England; but his impression was that early in January the Directors would be able to make a distribution of the whole of the new stock. The shareholders would get their dividend on

trading up to June 24 last. Their dividend to Sept. 1 was prescribed by the Act; and from Sept. 1 the interest on their water stock would begin to accrue. So it would be seen that they had a perfect continuity of income. Then there was the question of those who preferred to take cash. They would get their money in the course of a few days; but they would receive nothing from Sept. 1 as far as interest was concerned. Therefore, the Board had thought it right that the interest which the money had earned on deposit, at the rate of 2½ per cent. from Sept. 1 to the time that the cash was distributed, should be sent to such shareholders. He then gave an outline of the progress of the business during the past twenty-eight years. Having expressed regret at the death of Sir Richard Wyatt, who had been a Director for upwards of twenty-five years, he moved the adoption of the report.

Mr. CHARLES M. VIALLS seconded the motion.

The CHAIRMAN, replying to a shareholder, said that the money received for the Battersea works was included in the £3,603,000 compensation.

Mr. DUCK said that he had been most interested in the Chairman's speech; and it was evident from what they had been told that the Board had had a very anxious time of it in the course of the last twenty-eight years. He moved the following resolution: "To mark the appreciation of the shareholders for services rendered in the successful control and administration of the Company, it is resolved that the Directors be, and they are hereby authorized to retain, out of the compensation monies awarded to the Company, the sum of £18,000 for the following purpose: To divide among the Directors the sum of £10,000 as and how they, or the majority of them, may determine, and to pay to the officers (other than the Engineer), clerks, and collectors employed at the head office a sum equal to six months' salary, not taking into account commission or other emoluments, and, in the discretion of the Directors, among the Engineer and others in the employment of the Company as shall be approved by them, and such other persons who in their opinion have rendered any special services to the Company."

Dr. F. MILBURN seconded the motion.

Mr. POOLE thought that they ought to make the amount £20,000; and he moved accordingly.

Mr. DUCK expressed his willingness to make the amount £20,000; and, after further discussion, the resolution, as thus amended, was unanimously agreed to.

The CHAIRMAN briefly thanked the meeting for the generous manner in which they had treated the Directors and the staff.

The SECRETARY, on behalf of the staff, also thanked the shareholders for their kindness.

Resolutions were afterwards passed as follows: That, so soon as the certified profit for the period to June 24 last had been received from the Water Board, the Directors should pay such dividend on the ordinary stock and class "D" shares as they should deem advisable, and carry the balance, if any, to the credit of the liquidation account; that interest at the rate of 5 per cent. per annum on the preference stock, and 7 per cent. per annum on the ordinary stock and class "D" shares, for the period from June 24 to Sept. 1, in accordance with the Metropolis Water Act, 1902, should be paid forthwith; and that interest at the rate of 2½ per cent. per annum in respect of the period from Sept. 1 to Dec. 1 be paid to those stock and shareholders who elected to receive their compensation in cash.

The proceedings terminated with a vote of thanks to the Chairman.

NOTES FROM SCOTLAND.

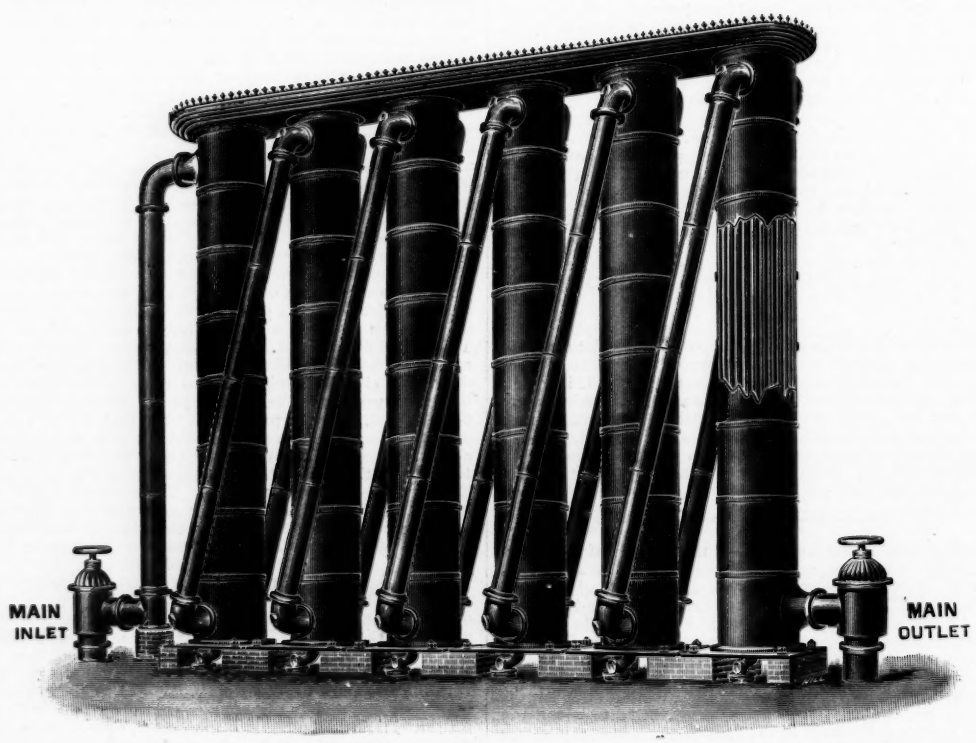
From Our Own Correspondent.

Saturday.

When I mentioned last week that Mr. A. Yuill, of Dundee, had prepared an illustrated booklet dealing with the Corporation Gas-Works (a description of which appears on p. 904), I was unaware that it was to be the accompaniment of an official visit to the works by the Town Council. This visit, which took place on Thursday, was in celebration of the completion of the renovation of the gas-works which began some years ago. At the conclusion of the inspection, the Council were entertained at luncheon by Mr. G. Stevenson, the Convener of the Gas Committee, in the Royal British Hotel. Lord Provost Barrie proposed "Success to the Gas-Works." He said that although the improvements were designed and inaugurated before he came, Mr. Yuill had had the development of the work, and deserved a great deal of credit for the energy he had displayed. Than Mr. Stevenson he knew that the Town Council could not have had a better man for Gas Convener. By not reducing the price too rapidly, they were acting on true business lines in writing down their capital and at the same time perfecting their machinery, and being thus enabled to give the best possible results at the very lowest possible cost. The Chairman (Mr. Stevenson), in replying, said they had to bear in mind that the electric light was now competing with gas; but if they could get the incandescent mantle into every dwelling, the Manager would turn out sufficient gas for light, fuel, heat, or motive power to supply all the wants of the city. They were not to understand that the gas-works had reached their maximum, and that further progress would not be made. Treasurer Ritchie, who also replied, expressed regret at the absence through indisposition of ex-Provost Ballinghall. If anyone had borne the "burden and heat of the day," it was ex-Provost Ballinghall. By the introduction of carburetted water gas, they had, he was sure, effected a very great saving in the production of the gas, and also in the mode of carrying out their purpose of reducing the cost. There was no doubt that the capital account was still too high; but it was gradually coming down. Ex-Provost Brownlee, in giving "The Gas Profession," said they had taken a good long time to carry out their transformation in Dundee; but what had been done had been done well. Who would have supposed ten years ago that gas-works of such size could be carried on with so little manual labour? Mr. A. Wilson, of Glasgow, said he had accepted the invitation to inspect the

CONDENSERS.

WATER COOLING.



ATMOSPHERIC.

C. & W. WALKER, LTD.,

Midland Iron Works: DONNINGTON, SALOP.
London Office: 110, CANNON STREET, E.C.

works largely as a tribute to the memory of Mr. William Foulis, the late Gas Manager of Glasgow, who had done a great deal for the Dundee Gas Department, as he did for the gas industry all over the world. The works had been well designed and well carried through. Mr. Yuill occupied a very high place in his profession; and anyone going round the works could not help being pleased with the condition in which they were kept.

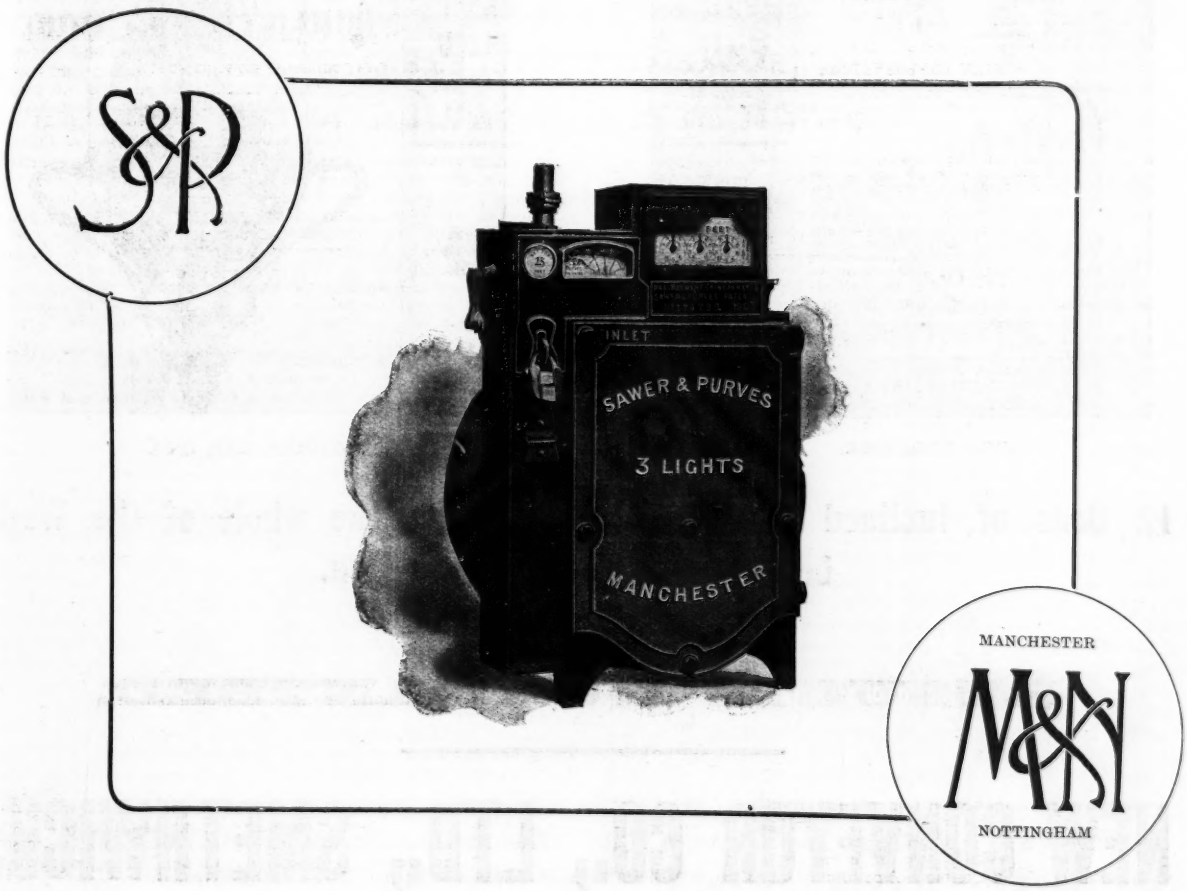
The Monifieth Town Council on Tuesday discussed the situation which has arisen in consequence of a requisition by twenty ratepayers, asking the Council to take a poll upon the question of the adoption of the Burghs Gas Supply Acts. The Town Clerk said that the requisition had been signed by a sufficient number of ratepayers, and a poll must be taken. In the course of the discussion upon the subject, it was insisted that a public meeting should be held before the poll, at which the objectors should be asked to state their reasons for objecting. The poll was fixed to take place on the 27th inst.; and the members of the Council who are not shareholders of the Gas Company were appointed a Committee to make arrangements for it.

At a meeting of the Arbroath Town Council on Tuesday, a most interesting report was presented by Mr. A. C. Young, the Gas Manager, on a visit paid by him to the Gas Exhibition at Earl's Court, London. Mr. Young entered at considerable detail into the immense strides which have recently been made in the manufacture and distribution of gas, both for lighting and heating purposes, and showed that in many cases gas was taking the place of other forms of heating and motive power. Mr. Young was awarded a very cordial vote of thanks for his paper. One of the councillors remarked that, by his excellent report, Mr. Young had bottled up electricity, so far as Arbroath was concerned. At the same meeting, the Gas Committee reported that they had considered the expediency of extending the new retort-bench by providing additional ovens on the new regenerative principle, which had been brought by the Manager before the Committee at their meeting on Feb. 3 last, and which it was then agreed to take into consideration during the year 1904-5. From a further report on the subject made by the Manager, it appeared that a portion of the old retorts would probably be required to be put in use about Christmas, and a section of the old retort-bench was being got in readiness for this period of maximum output. This did not provide a sufficient reserve in case of any breakdown, even though all the new retorts were in good order; and he further explained that the use of the old retorts involved considerable additional expense over those of the new system. The Manager also pointed out that a reserve of 25 per cent. of retorts ready for use was customary, and there seemed the greater necessity for an adequate reserve in the case of Arbroath, as the holders were only capable of containing 300,000 cubic feet of gas, while the output per twenty-four hours would reach from 400,000 to 450,000 cubic feet during the present month. The Manager recommended that the new work should be done during the summer months, when it would cause the least inconvenience at the gas-works, and suggested that if permission were now given him to prepare drawings and specifications for the extensions, the final sanction of the Town Council might be obtained in February next, and the contractors be enabled to proceed in spring. The recommendation that the extension should consist of four ovens of eight retorts each, equal to 32 retorts in all, which had been made by the Manager in February last, was adhered to. He proposed to add an extra length of foul main in order to carry out the cooling of the gas gradually, for the reasons stated in his report. Including this, the whole cost of the extensions proposed by him was estimated at £1700. The Committee, after full consideration, unanimously approved of the Manager's proposal; and, subject to the approval of the Town Council, resolved to instruct him to prepare the necessary drawings and specifications, with the view of tenders being obtained. The Committee's recommendation was agreed to.

A question relative to the illuminating power of the gas supplied in Broughty Ferry has been raised in the Town Council this week. The gas is tested by the Manager—Mr. G. Keillor—and by the Burgh Surveyor. In his report, Mr. Keillor stated a maximum illuminating power of 21·83 candles, and a minimum of 19·13 candles; whereas the Burgh Surveyor stated a maximum of 19·64 candles, and a minimum of 18·56 candles. Mr. Sim thought an explanation as to the disparity of the figures was required. Mr. Crystal, the Convener of the Gas Committee, replied that the tests were probably made at different hours of the day. The Burgh Surveyor's tests were made at the Municipal Buildings, and the Gas Manager's at the works. He reminded the Council that they had been advised that there might be a difference of a candle in the illuminating power as given by the two tests. It was reported that the contracts in connection with the alterations and additions to the gas-works, which were entered into last spring, had now been completed. The estimates showed an expenditure of £2515; the contract prices amounted to £2397; and the actual outlay had been £2599. The Council declared themselves highly satisfied with the result.

The Committee of the Plumbers' and Ironmongers' Association of Edinburgh and Leith have met this week and resolved to prosecute with vigour their protest against municipal trading by the Edinburgh and Leith Gas Commissioners.

Damage to Roads by Extraordinary Traffic.—A meeting of the Masham Urban District Council was held last Friday, at which the award of the Arbitrator (Mr J. H. Taylor, of Barnsley) was submitted. The arbitration arose out of the conveyance of the heavy plant to the sites of the proposed new water-works near Masham for the Leeds and Harrogate Corporations; the district roads being in consequence damaged, owing to the exceptionally heavy loads. After taking into consideration the fact that the Harrogate Corporation had themselves spent £1170 11s. 6d. in repairing the roads, the Arbitrator finds that the cost to the Masham Council for extraordinary traffic had been £3170. He orders Harrogate to pay £1878 of this sum, and Leeds the balance of £1292. The Harrogate Corporation had already paid £800 and Leeds £700 on account; and these sums are allowed off the above awards, so that Harrogate has yet to pay £1078 and Leeds £592.



CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Dec.* 17.

Sulphate of Ammonia.

Although there has been a fair amount of inquiry, the market has been quiet and somewhat irregular, buyers hanging back for the chance of lower prices. Second-hand parcels have also been offered, and these, with the smaller makes, have had to be disposed of at a decline. The large makers, however, being already rather fully sold, have for the most part been firm, and the closing quotations are £12 15s. per ton f.o.b. Hull, £12 17s. 6d. per ton f.o.b. Liverpool, and £13 per ton f.o.b. Leith. The forward position has again been neglected, buyers being less keen than they were at the end of November, and makers being unwilling to go on unless at a further advance.

Nitrate of Soda.

The Continental market has assumed a firmer tone, and something of the recent decline has been recovered. Local prices remain 11s. and 11s. 3d. per cwt., for ordinary and refined qualities respectively.

LONDON, *Dec.* 17.

Tar Products.

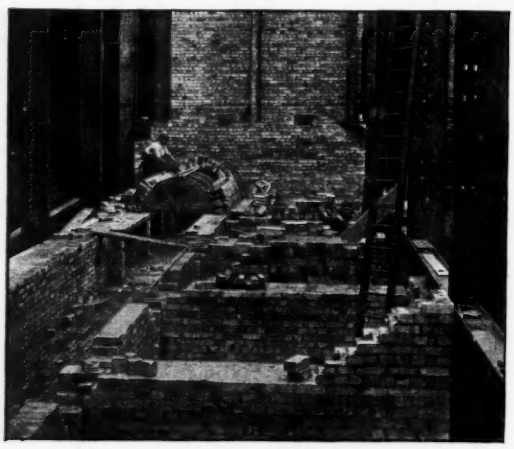
Markets generally have been rather quiet during the past week, doubtless owing to the approach of the holidays. There has been no actual business to report in anthracene; and the market remains stationary, although early in the week there was an inquiry for a considerably quantity of 40 per cent. "A" quality for delivery all over next year. Makers, however, do not care to offer for forward delivery at existing prices; while consumers appear perfectly indifferent as to the market, being evidently well supplied for some time to come. Benzol is scarcely so firm; and there is certainly more offering in the North. London refiners appear well sold in 90 per cent.; but as regards 50-90 per cent., the demand appears to have ceased—at any rate for the time being, as there are now sellers at 8½d. without finding buyers. Further business in toluol is reported in London at 7½d., but only for small quantities and for special purposes. Solvent naphtha is still in fairly good demand for early delivery; but there is certainly more offering in the North of England for forward delivery, while the demand for export does not seem to improve. In pitch, so far as London is concerned, makers maintain their ideas and still ask 38s. 6d. per ton, at their works, which has again been paid. Little business is, however, being done, owing to the strong disinclination of the makers to sell. There is evidently a little stagnation in the market just at present; but this is easily accounted for by the season of the year, as many fuel works will be closed until after the New Year. In South Wales, there is still a fairly good inquiry for forward delivery; but consumers are not at present prepared to pay the prices asked by dealers. The demand from Belgium is not quite so good as was the case a little while ago; certain consumers having evidently decided to wait until after the New Year before making their contracts for April-June delivery. The general tone of the market is certainly easier all round, although as a rule manufacturers do not seem inclined to reduce their prices; being fairly well sold over the first six months of next year. Carbolic acid continues in strong demand, especially for early delivery. Business is reported to a considerable extent for January-February; but as regards March-June, buyers do not seem inclined to purchase at the moment. It does not appear to be quite so much a question of price as the uncertainty as to the future of crystals, the price of which is, however, at present decidedly firm. Several transactions are reported to have taken place in 39-40 per cent. for delivery over the first six months of next year; but just at present the German manufacturers are evidently sellers at a little under the prices quoted by English producers. Creosote is decidedly quiet; and, if anything, there is more offering, especially for early delivery. The two largest producers still maintain their price; but there are second-hand parcels offering on the market at 1¾d., and it is generally believed that a little less than this figure would be accepted. In the Provinces, business is reported in Yorkshire at 1¼d. for delivery over the next three months; but as a rule makers ask 1⅜d.

The average values during the week were: Tar, 18s. to 22s. Pitch, London, 37s. to 37s. 6d.; east coast, 34s. 6d.; west coast, 33s. 6d. to 34s. 9d. Benzol, 90 per cent., 10½d.; 50-90 per cent., 8½d. Toluol, 7½d. Crude naphtha, 3½d.; solvent naphtha, 8½d. to 9d.; heavy naphtha, 10d. Creosote, London, 1 11/16d. to 1¾d.; North, 1¼d. to 1 5/16d. Heavy oils, 2⅝d. to 2¾d. Carbolic acid, 60 per cent., 2s. 2½d. to 2s. 3½d. Refined naphthalene, £4 to £8 10s.; salts, 20s. to 21s. 6d. Anthracene, "A" quality, 1½d. to 1⅝d.; "B" quality, unsaleable.

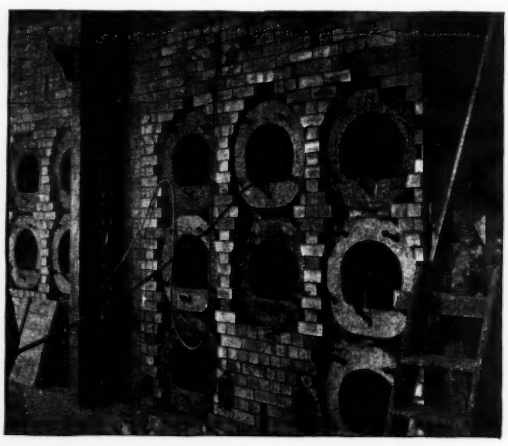
Sulphate of Ammonia.

The market is decidedly quiet; and the demand does not appear to be so strong, which, however, is not unusual at this time of year. The Gaslight and Coke Company still quote £13 10s. for January-June; but business is not possible at this price just at present. The South Metropolitan Company's position remains unchanged. They are only sellers for December-January, and appear quite indifferent as to placing anything just at the moment. In Hull, business has been done at £13 for December-January; while £13 2s. 6d. is reported to have been paid for January only. Business in Leith has again been done at £13 for December shipment; and there are still sellers at this price. As regards January-June, makers appear quite indifferent, and as a rule decline to quote.

Hornsea Water Supply.—The Hornsea District Council sat with closed doors on Monday last week to discuss the question of the water supply. Under the present system, there is only just sufficient water to meet requirements. In the result, the Council decided to adopt the air-lift system of pumping, and to apply to the Local Government Board for a loan for this purpose.



JULY 25th, 1904.



OCTOBER 15th, 1904.

12 Beds of Inclined Retorts, Erected by us, the whole of the Work being done by our own Men.

RESULTS GUARANTEED.

NEW CONVEYOR CO., LTD., SMETHWICK.

COAL TRADE REPORTS.

Lancashire Coal Trade.

A steady output of all kinds of house and engine coal from the pits continues. The miners are kept on full time. Prices for slack and engine fuel have hardened. An increase of about 3d. per ton has been secured on renewed contracts for this class of coal. Coal for forge purposes and coke has met with a fair demand. House varieties have not quite fulfilled the expectations of those who have been anxiously looking forward to a busy time; but it may come after Christmas. Coal for shipping is in moderate request. Cannel for gas-works goes out in larger quantities. Prices show no material alteration—viz., best house coal 13s. to 14s., seconds 11s. to 12s., and common 9s. to 10s. at the pits. Steam and forge coal is 8s. to 8s. 6d. for better qualities, inferior a little cheaper, best slack 6s. 6d. to 7s., secondary 5s. to 5s. 6d., and common 4s. 3d. to 5s. at the pit mouth.

Northern Coal Trade.

There is a moderate demand for steam coals; some of the chief avenues of that branch of the trade being closed for the winter. Best Northumbrian steams are 9s. per ton f.o.b., second-class steams are plentiful at from 8s. to 8s. 3d., while steam smalls are rather scarce at from 4s. 3d. to 4s. 9d. Locomotive coal contracts to a large extent have been settled for next year at a reduction of about 3d. per ton on the contracts that are near expiry. In the gas coal trade, the demand is now at its fullest; but the heavy output at the pits enables it to be met, though there has been little free coal beyond the contract quantities. Gas coal may be quoted from 7s. 10d. to 8s. 4½d. per ton f.o.b., according to quality; and some small lots have been sold for next season at such prices, while one or two other contracts are in course of negotiation. Coke is firm; but gas coke is now very plentiful, and in the inland towns the stocks are heavier and prices do not show much change.

Outlook for Coal in 1905.

The following paragraph appeared under this heading in yesterday's "Pall Mall Gazette:" Having on Saturday last briefly reviewed the unsatisfactory course of the English coal trade during 1904, we are glad to be able to write a little more hopefully of the probable course of events in the coming year. Contracts for well on towards a million tons have recently been placed; and though in some cases quotations have fallen 3d. per ton, there have been concessions, on the part of purchasers, as to delivery, which render prices practically equivalent to those of last year. For instance, in the case of the contract for the supply of the Barcelona Gas-Works (120,000 tons), delivery is extended over two years, so that the price fixed—8s. per ton., f.o.b. Tyne—though nominally a fraction under that of twelve months back, is considered as good for all practical purposes. When the big gas companies enter the market, it will probably be found that values have moved in favour of coalowners.

TRADE NOTES.

Bryan Donkin and Clench's Exhausters.

Probably most gas engineers and managers who visited the exhibition at Earl's Court noticed the stand of Messrs. Bryan Donkin and Clench, Limited, of Chesterfield and London, in the Queen's Palace. Particulars of the exhausters made by the firm are now being issued by them in a pamphlet, which contains illustrations of the two shown at the exhibition and others, accompanied by detached descriptions of their exhausters, with instructions for taking them apart and putting them together again.

West's Combined Machines.

The Gas Committee of the Oldham Corporation have, on the recommendation of their Engineer, Mr. T. Duxbury, decided to instal the West compressed-air combined charging and drawing machines in the retort-house now under reconstruction at their Hollinwood station; and a contract has been placed with West's Gas Improvement Company, Limited, for a complete installation—including two combined charging and drawing machines, air-compressor, automatic hose gear, and the necessary coal elevating and conveying machinery, storage hoppers, and other appendages for the retort-house. The contract also includes a complete installation of coal breaking, elevating, and conveying machinery for filling the coal-stores, on somewhat similar lines to the coal-handling machinery erected at the Higginshaw Gas-Works by the same firm. This plant includes a coal and cannel breaker, automatic feeder to the breaker, coal-elevator, and overhead coal-store conveyor, all capable of dealing with 30 tons of coal per hour; and the plant is so arranged that a large proportion of the coal can be delivered over shields covering the retort-house elevator, in order that the bulk of the coal can be elevated to the retort-house without trimming. The decision regarding the combined machines has been arrived at after a visit by a section of the Gas Committee to Wellingborough, to inspect the combined machine installed there, where, during the time of their visit, fourteen retorts were drawn and charged by the machine in twelve minutes.

Gilbert Little and Sons, Limited.

We have been asked to state that the patents taken out by Mr. A. S. B. Little will not be controlled by the above Company, but, in accordance with an arrangement made with the New Conveyor Company, Limited, will be, as heretofore, manufactured by them. Included are the new hot-coke conveyor, gravity-bucket conveyor, and inclined retort-charging arrangement now being installed at Hull, Hanley, &c., and the conveyors in hand for the London County Council, and at work at the Auckland Gas-Works, &c. We understand Mr. Archibald Little is not connected with the Company trading under the above name.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer

London Offices: 19, ABINGDON STREET, WESTMINSTER, S.W.
American Offices: TORONTO. TELEGRAPHIC ADDRESS: "CARBURETED, LONDON."

CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
BLACKBURN	1,250,000	ST. CATHERINES (Remodelled)	250,000	TONBRIDGE	300,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	STRETFORD	800,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	OLDBURY	300,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	TODMORDEN	500,000
BIRKENHEAD	2,250,000	ST. CATHERINES (2nd Cont.)	250,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	YORK (Second Contract)	750,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	ROCHESTER (Second Contract)	500,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	NEWPORT (MON.)	250,000
HALIFAX	1,000,000	YORK	750,000	TOKIO, JAPAN	1,000,000
TORONTO	250,000	ROCHESTER	500,000	PERNAMBUCO (Brazil)	125,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	MALTON	150,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	DULUTH, MINN. (2nd Cont.)	300,000
MONTREAL	500,000	CATERHAM	150,000	BROCKVILLE (ONT.)	250,000
TORONTO (Second Contract Remodelled)	2,000,000	LEICESTER	2,000,000	SMETHWICK	500,000
BELLEVILLE	250,000	ENSCHEDE (HOLLAND)	150,000	GRAVESEND	300,000
OTTAWA (Second Contract)	250,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	NEWPORT MON. (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000	BURNLEY	1,500,000	TORONTO (Third Contract)	750,000
		KINGSTON-ON-THAMES	1,750,000	TORONTO (Fourth Contract)	1,000,000
		ACCRINGTON	500,000	MONTREAL, ONT. (2nd Cont.)	1,800,000
				HAMILTON, ONT.	400,000

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.

AND, IN ADDITION, 5,300,000 CUBIC FEET DAILY; also Coal-Gas Plants at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG.

Proposed Combination Water Scheme in East Northumberland.—A proposal has been made by the Newbiggin-by-the-Sea Urban District Council which, if carried out, will settle the water difficulty in a large part of the East Northumberland district. The Council desire the local authorities between Newbiggin and Morpeth to combine in a scheme for bringing the Tynemouth water supply into their respective districts. At the present time the Tynemouth Corporation water-mains run as far as Mitford, near Morpeth, and they could be brought through Pepwood, Ashington, Hirst, and Woodhorn into Newbiggin. The latter Council have agreed to ask the various Councils to co-operate in the scheme suggested; and the Surveyor has been instructed to prepare an estimate of the cost of laying the pipes.

Saddleworth Water Supply.—The great agitation which was raised in Saddleworth not very long ago against the change in the water supplied by the Ashton, Dukinfield, and Stalybridge District Water-Works Committee has been attended with a result which has caused great jubilation. About a year ago, the old tank supply, furnished under Act of Parliament, was cut off, and the water from a newly completed reservoir substituted. This was found to contain so much peaty matter as at times to make the water of inky blackness; and, according to the Medical Officer of Health, it caused several deaths, while the acid reaction let to an outbreak of lead poisoning. Residents gave up using the water, and fetched their supply from springs; and this led to an outbreak of typhoid fever, due to pollution. An indignation meeting was called, and the help of the County Council requisitioned—a demand being made for the restoration of the tank supply. Failing compliance, it was determined to proceed to litigation. While holding that there is no legal compulsion in the matter, the Committee's Solicitor announced that the tank supply was again being resorted to; and it was turned on last Thursday night.

Cost of the Torquay Water-Works Extension.—A statement as to the expenditure on the new reservoir which is being constructed at Tottiford was made at a meeting of the Torquay Town Council last Tuesday. Mr. Bovey, the Chairman of the Water Committee, said the expenditure up to the present was £18,988, of which £13,710 was for actual work. The land cost £2065, instead of £262 as estimated; and the parliamentary costs, which were put at £500, came to £3211. He could not now make a statement as to the excavation of the trench and the construction of the dam. An expert had examined the works. Mr. Pike said the estimated cost of the scheme was £22,000; but he did not think they knew to £10,000 or £20,000 what the outlay was going to be. He had every confidence in the Water Engineer, and considered the employment of an expert unnecessary. Mr. Bale, on the other hand, contended that the result showed the folly of embarking on such a large undertaking without having the advice of an expert. Mr. Bovey admitted that the ground had been found deceptive, though trial pits had been sunk. He could not at present say anything as to the ultimate cost of the works. The engagement of an expert to visit the works was suggested by the Committee; and was also wished for by the Water Engineer.

Runcorn and the Vyrnwy Water Supply.—At their last monthly meeting, the Runcorn Urban District Council ratified an agreement with the Rural District Council to provide Vyrnwy water for the townships of Weston and Halton. Mr. Pritchard, the Chairman of the Water Committee, explained that under the Liverpool Water Act the Council would be liable for a minimum supply of Vyrnwy water of 300,000 gallons per day, equal to an annual payment of £2737. The trunk main to connect with the Vyrnwy main would cost £3500, which would involve an annual repayment of principal and interest of £197. The total liabilities would be £2934. The Weston Point works undertook to pay for 115,000 gallons per day, which would be a certain income of £1485. A rate of 7d. in the pound would be required to make up the deficiency in water revenue. At present, however, 2d. in the pound was levied for water; and the increase would thus be 5d. on the district rate. In 1908, liabilities equal to 4⅛d. in the pound would cease; so that the rate when this time arrived would not exceed the amount now paid. The present water supply was utterly unsuitable for works, and when soft water was available a greatly increased consumption was anticipated. The scheme was adopted.

Loughborough Water Supply.—At a special meeting of the Loughborough Town Council recently held, a report was presented by the Water Committee, stating that the time had arrived when application was required to be made for powers to extend the period allowed for the construction of the Blackbrook reservoir and other works. Owing to delay on the part of the contractors, it was impossible for the reservoir to be completed within the time stipulated by the Loughborough Corporation Act, 1897—viz., within eight years of the passing of the Act; and in view of the fact that the Local Government Board had no power to grant an extension of time by means of a Provisional Order, it was recommended that the Council should adopt the only alternative course open, and that was the promotion of a Bill in the ensuing session of Parliament. Further filtering capacity was urgently needed; and the Committee recommended that power should be sought for acquiring compulsorily or by agreement 2¼ acres of land adjoining the filter-beds. It was recommended that authority should be obtained to borrow £80,000 for completing the Blackbrook works, extending the mains throughout the area within which the Corporation were authorized to supply water, defraying the cost of land for filter-beds, the construction of filters, &c. The Committee thought that an extension of four years should be asked for. In moving the adoption of the report, Mr. J. Cartwright, the Chairman, said there was no alternative to the proposal to apply for £80,000, but it should be borne in mind that the whole of this sum was not required for the Blackbrook works. It was deemed necessary to expend a further £40,000 on the Blackbrook scheme, and the balance would be a kind of reserve should extensions be rendered necessary. Of the first item of £40,000 mentioned, half the amount would be used in connection with extra works that had been found essential as the scheme proceeded. After some discussion, the report was adopted unanimously; and it was decided to promote a Bill next session in accordance with the Committee's recommendations.

Holmes's Exhibits
AT THE
ST. LOUIS EXHIBITION.

Copy of Cablegram received from our American Agents:

Holmes
Huddersfield.
Western Gas also additional Valves apparatus Grand Gold awarded including Prize - Medal. Grand Holmes Holmes congratulations. westergas. Prize - Scrubbers Scrubbers

WHITESTONE IRONWORKS, HUDDERSFIELD.

11, VICTORIA STREET, WESTMINSTER.

Sale of Barnsley Gas Company's Stock and Shares.—At the Royal Hotel, Barnsley, last Wednesday, Messrs. Lancaster and Sons sold two lots of £100 of stock in Barnsley Gas Company for £201 per £100, and four "G" shares, £10 paid, yielding 7 per cent., for £14 10s. each.

The Trade Exhibitions Company, Limited, has been registered with a capital of £5000, in £1 shares, to adopt an agreement with G. D. Smith and F. W. Bridges, to promote and conduct exhibitions, to promote and protect trade, &c. There will be no initial public issue. The first Directors are Messrs. Smith and Bridges.

The Crewkerne District Council and the Water-Works.—At the last meeting of the Crewkerne District Council, it was resolved to ask the Directors of the Water Company whether they would meet a deputation of the Council to discuss the possibilities of arriving at a basis on which to re-open negotiations for the purchase of the undertaking.

A Question of Discounts.—At the meeting of the Tiverton Town Council yesterday week, Mr. W. Rowcliffe drew attention to the large sums paid every month for coal for the gas-works, and asked whether there were no discounts allowed. Mr. Grater complained that the Gas Committee purchased from outside firms goods which might be bought in the town. Alderman J. Thorne, in reply, said that all obtainable discounts came to the Council, but many of their bills were net. With regard to the Committee's purchase, certain goods were bought from gas specialists; but they would do all possible to benefit local firms.

Dover Gas-Works Recreation Room.—To commemorate the seventeenth anniversary of the opening of this room, the Chairman (Mr. Willsher Mannering) entertained the members at a smoking concert, including a talking-machine competition, on Monday last week in the building. All the members were presented with a large photograph of themselves in one group. The chair was taken by the President (Mr. Raphael Herring), who was supported by Mr. Mannering and some of the Directors. A thoroughly enjoyable evening was spent; most of the items on the programme being contributed by the members.

The Lighting of Sabden.—After a considerable amount of discussion, it has been agreed to adopt the Lighting Act for the whole of Sabden. The trouble in settling the matter has been caused by the peculiar position of Sabden, which is divided into two townships—Pendleton and Read. The latter side had already adopted the Act; but the Pendleton side (which includes the larger portion of Sabden) could not for a long time agree. It is proposed to provide 25 lamps, which will be lighted with petrol gas consumed through incandescent burners—a system which has been on trial there and is said to have given general satisfaction.

Water-Works Extension at Plymouth.—At their meeting yesterday week, the Plymouth Town Council adopted a recommendation of the Water Committee that application should be made to the Local Government Board for sanction to a loan of £11,000 for the extension and renewal of mains. The Water Engineer (Mr. F. Howarth) suggested that £20,000 should be raised; but the Committee came to the conclusion that the smaller sum would suffice for the present. It was also decided to ask the Board to make the sanction general, so that the amount authorized may be expended on mains required within any portion of the district of supply—returns to be furnished to the Board from time to time as the works are completed.

Farington Water Scheme.—A Local Government Board inquiry was held recently at Farington, by Mr. Coke, into an application by the Preston Rural District Council to borrow the sum of £3000 for the purposes of a water scheme for Farington. Mr. J. Clarke, the Clerk to the Rural District Council, and Mr. F. E. Dixon explained the scheme, which is to supply the district of Farington with water from the Preston Water-Works. It was pointed out that it is only intended to lay the supply in the portion of the district where it is at present required—viz., in the north ward. Mr. M'Iver, however, said he thought it was advisable that the scheme should include the south ward as well, as there were likely to be a good many more residents there in the near future.

Stockport and Its Gas-Works.—At the invitation of the Gas Committee, the members of the Stockport Corporation, to the number of about 30, visited the gas-works last Wednesday on a round of inspection. The members were shown the old horizontal retorts, some of which are almost worn through, and the few inclined retorts which are being experimented with. They also inspected the water-gas plant, and the process for the purification of gas was fully explained by the Engineer and Manager (Mr. S. Meunier). The laboratory was also visited, and the way in which the illuminating power of the gas is tested was explained. The members subsequently partook of tea; and the Chairman (Alderman J. R. Clarke) and the other members of the Committee received a hearty vote of thanks for their invitation. Afterwards the company visited the electricity works, and inspected with interest the new Parsons turbine which has just been put in.

French and Continental Lighting Company.—At the recent general meeting of this Company, which was held in Paris under the presidency of M. le Baron Léonino, the Directors reported that the sale of gas at the Moscow works had increased, as had the profits realized at the French stations; but this advantage was counterbalanced by a depreciation of the stock of coke at Moscow. At Amiens the receipts were satisfactory; but at Carcassonne they were slightly less than in 1902-3. The expenses at Moulins were too heavy to allow of a dividend being paid; but at Lisbon it was 2025 reis, against 1350 reis for 1902-3. Continued improvement was reported at Oporto. At Alost, the dividend was, as before, 6 per cent. on the preference shares. Altogether the profits realized amounted to 1,263,486 frs. (£50,540), of which 964,727 frs. came from works; being a decrease of 86,104 frs. compared with the previous year. The coupons and interest collected increased by 41,390 frs. From the total profits there had to be deducted 1,105,257 frs.; leaving 158,229 frs. as the net profit, which was reduced to 150,318 frs. after the deduction of the statutory reserve of 5 per cent. Adding the 3168 frs. brought forward, made a total of 153,486 frs., which was sufficient to pay a dividend of 7·50 frs. per share (500 frs.), and leave a balance of 3486 frs. to be carried forward.

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Last week a Brixton chimney sweep, when brought up at the Lambeth County Court on a judgment summons, stated that his trade had been ruined by the introduction of gas-stoves. He and many others of the same occupation were now either starving or had been driven to different employment. No order was made.

On the recommendation of the General Purposes Committee, the Warwick Town Council have decided that, with the object of providing a supplemental water supply, a reservoir of 500,000 gallons capacity shall be constructed opposite Hatton Asylum, if arrangements can be made for acquiring the land. The cost of the work will be £10,000; and, as far as possible, local labour will be employed upon it.

At the meeting of the Bermondsey Borough Council last Tuesday, the General Purposes Committee had before them three tenders for the supply of 300 incandescent No. 3 Welsbach bye-pass burners, including mantles, governors, globes, and reflectors. Among them was one from Messrs. Henry Greene and Sons, Limited, for £165, compared with £183 5s. and £193 quoted by the other firms tendering. Messrs. Greene also submitted an alternative estimate for their patent burner and climbing light, which dispenses with the use of the bye-pass, amounting to £150. The Committee found, on actual test, that the saving of gas by the omission of a bye-pass would be about 2160 cubic feet per burner per annum, which, at the present price of gas, amounts to 4s. 4d., and for the whole of the 300 burners represents a saving of £65 per annum.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 902.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Oct. 13	10½	Alliance & Dublin 10 p.c.	20½—21½	..	4 17 8
100,000	10	,,	7½	Do. 7 p.c.	13½—14½	..	5 3 5
200,000	5	Nov. 11	6½	Bombay, Ltd.. . . .	0—6½	..	5 0 0
140,000	5	,,	6½	Do. New, £4 paid	4½—5	..	5 4 0
50,000	10	Aug. 31	14	Bourne-) 10 p.c. .	29—30	..	4 13 4
251,810	10	,,	7	mouth Gas) B 7 p.c. .	15½—16½	..	4 4 10
53,200	10	,,	6	and Water) Pref. 6 p.c.	14½—15½	..	3 17 5
380,000	Stk.	Aug. 12	12	Brentford Consolidated	245-250	..	4 16 0
300,000	,,	,,	9	Do. New . . .	187—191	..	4 13 9
50,000	,,	,,	5	Do. 5 p.c. Pref. .	125—130	..	3 16 11
206,250	,,	Dec. 15	4	Do. 4 p.c. Deb. .	105—108*	..	3 14 1
220,000	Stk.	Sept. 15	11	Brighton & Hove Orig.	222—227	+2	4 10 11
246,320	,,	,,	8	Do. A. Ord. Stk. .	163—168	+1	4 15 3
450,000	20	Sept. 29	10	British	40—41	..	4 17 7
100,000	Stk.	Aug. 12	6	Bromley, Ord. 5 p.c. .	117—122	..	4 18 4
165,700	,,	,,	4½	Do. do. 3½ p.c. .	92—95	..	4 13 9
500,000	10	Oct. 13	7	Buenos Ayres (New) Ltd.	11¼—11⅝	..	5 19 2
250,000	Stk.	June 29	4	Do. 4 p.c. Deb. .	95—97	..	4 2 6
150,000	20	July 14	8½	Cagliari, Ltd.	23—25	+1	6 12 0
100,000	10	Sept. 29	10	Cape Town & Dis., Ltd.	14⅜—15¼	..	6 11 2
100,000	10	Oct. 27	4½	Do. 4½ p c Pref . .	9¼—9¾	..	4 12 4
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	51—53	..	5 13 2
50,000	Stk.	June 29	4½	Do. 4½ p.c. Deb. Stk.	100—102	..	4 8 3
1,375,000	Stk.	Aug. 31	5½	Commercial 4 p c Stk. .	113—115	+1	4 10 5
560,000	,,	,,	5	Do. 3½ p.c. do. .	110—113	+3½	4 8 6
450,000	,,	Dec. 15	3	Do. 3 p c. Deb. Stk.	85—87*	+½	3 9 0
800,000	Stk.	,,	6½	Continental Union, Ltd.	111—116*	+5½	5 12 1
200,000	,,	,,	7	Do. 7 p c. Pref.	136—141*	+1½	4 19 3
486,790	10	July 14	11	European, Ltd. . . .	20—21	..	5 4 9
354,060	10	,,	11	Do. £7 10s. paid	14—15	..	5 10 0
15,243,200	Stk.	Aug. 12	4⅛	Gas-) 4 p.c. Ord. . .	99½—100½	+1	4 7 6
2,600,000	,,	,,	3½	light) 3½ p.c. max. .	91—93	..	3 15 3
3,799,735	,,	,,	4	and) 4 p.c. Con. Pref.	109—111	+1	3 12 1
4,193,975	,,	Dec. 15	3	Coke) 3 p.c Con. Deb.	86—88*	+½	3 8 2
258,740	Stk.	Sept. 15	5	Hastings & St. L. 3½ p.c.	90—95	..	5 5 3
70,000	10	Sept. 29	11	Hongkong & China, Ltd.	15—16	..	6 17 6
3,800,000	Stk.	Nov. 11	10	Imperial Continental .	206—208	+1	4 16 2
473,600	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb. Red.	96—98	..	3 11 4
175,036	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c. .	117—122	..	4 18 4
561,000	Stk.	Aug. 31	10	Liverpool United A . .	218—220	..	4 10 11
718,100	,,	,,	7	Do. do. B .	159—161	..	4 6 11
306,083	,,	June 29	4	Do. do. Deb. Stk.	108—110	..	3 12 9
£			p.c.				£ s. d.
75,000	5	Dec. 15	5	Malta & Medn., Ltd. .	4—4½*	..	5 11 1
560,000	100	Oct. 1	5	Met. of) 5 p.c. Deb..	102—104	..	4 16 2
250,000	100	,,	4½	Melbourne) 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	Nov. 11	3½	Monte Video, Ltd. . .	10—11	..	6 7 3
1,515,892	Stk.	July 29	4½	Newc'tle & G'tesh'd Con.	109—110	..	4 1 10
406,125	Stk	July 1	3½	Do. 3½ p.c. Deb.	92—92½	..	3 15 8
15,000	10	Aug. 31	10	North Middlesex 10 p.c.	19½—20½	..	4 17 7
52,940	10	,,	7	Do. 7 p c.	13½—14½	..	4 16 7
300,000	Stk.	Nov. 30	8	Oriental, Ltd. . . .	145—149	..	5 7 5
600,000	,,	Sept. 15	7	Ottoman, Ltd. . . .	5½—6½	..	5 12 0
235,005	Stk.	—	6½	Plym'th & St'house 5 p.c.	—	..	—
398,490	5	Apl. 28	5	Primitiva Ord. . . .	5⅛—5⅜	—⅛	4 6 11
796,980	5	July 28	5	Do. 5 p.c. Pref. .	4¾—5¼	..	4 15 3
488,900	100	Dec. 1	4	Do. 4 p.c. Deb. .	93—95	..	4 4 3
851,070	10	Oct. 13	7	River Plate Ord. . . .	11⅛—11⅜	..	5 16 8
300,000	Stk.	June 29	4	Do. 4 p.c. Deb. .	95—97	..	4 2 6
250,000	10	Sept. 15	6	San Paulo, Ltd. . . .	12—12½	..	4 16 0
70,000	50	June 29	5	Do. 5 p.c. Deb. .	53—55	+2	4 10 11
135,000	Stk.	Sept. 15	10	Sheffield A	238—240	..	4 3 4
209,984	,,	,,	10	Do. B	237—239	..	4 3 8
523,498	,,	,,	10	Do. C	236—238	..	4 4 0
123,998	Stk.	Sept. 29	5	Shrews'bury Ord. 5 p.c.	104½—107½	..	4 13 0
70,000	10	,,	11	South African	16—17	..	6 9 5
6,253,000	Stk.	Aug. 12	5½	South Met., 4 p.c. Ord.	150—132	+1	4 3 4
1,832,700	,,	July 14	3	Do. 3 p.c. Deb.	89—91	..	3 5 11
575,000	Stk.	Aug. 31	5½	S'th Suburb'n Ord. 5 p.c.	122—125	..	4 8 0
60,000	,,	,,	5	Do. 5 p.c. Pref. . .	120— 25	..	4 0 0
112,533	,,	July 14	5	Do. 5 p.c. Deb. Stk.	133—138	..	3 12 6
502,410	Stk.	Nov. 11	5	Southampton Ord. . .	104—106	..	4 14 4
87,950	,,	—	4	Do. 4 p.c. Deb.	—	..	—
120,000	Stk.	Aug. 31	6¼	Tottenham) A 5 p.c. .	122—127	..	4 18 5
325,520	,,	,,	4¼	and) B 3½ p.c. .	95—100	..	4 15 0
115,000	,,	Dec. 15	4	Edmonton) 4 p.c. Deb.	102—105*	..	3 16 2
182,380	10	,,	8	Tuscan, Ltd.	8½—9*	..	8 17 10
149,900	10	July 1	5	Do. 5 p c. Deb. Red.	96—98	..	5 2 0
30,000	Stk.	Aug. 31	7½	Wands-) A 5 p.c. . .	160—165	..	4 13 11
255,636	,,	,,	6¼	worth) B 3½ p.c. . .	130—135	..	4 12 7
51,293	,,	,,	5 17/20	and) C 3½ p.c. . .	110—115	..	4 13 6
57,564	,,	June 29	3	Putney) 3 p c Deb. Stk.	78—83	..	5 12 8
745,872	,,	Aug. 12	5	West Ham 5 p.c. Ord. .	99—101	..	4 19 0
85,000	,,	,,	5	Do. 5 p.c. Pref. . .	120—125	+3	4 0 0
163,000	,,	June 29	4	Do. 4 p.c. Deb. Stk.	103—108	..	3 14 1

Prices marked * are Ex div.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

MANAGER (HONG KONG). Hong Kong and China Gas Company. London Office.
TRAVELLER. No. 4308.
TRAVELLER (JUNIOR). J. Wright & Co., London.
REPRESENTATIVE (GAS AND ELECTRIC). No. 4311.
GAS-WORKS ERECTOR. No. 4312.

Stocks and Shares.

CITY OF NORWICH WATER COMPANY. Dec. 31.
NEWCASTLE AND GATESHEAD WATER COMPANY. Jan. 17.

TENDERS FOR

Coal.

COPENHAGEN LIGHTING DEPARTMENT. Tenders by Jan. 16.

Coke.

PINNER GAS-WORKS.

Condensers (Water Tube and Pelouze and Audouin).

EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by Jan. 30.

Fire-Clay Goods.

BUXTON GAS DEPARTMENT. Tenders by Dec. 31.
MANCHESTER GAS DEPARTMENT. Tenders by Jan. 6.

Gas Exhausters and Engines.

EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by Jan. 30.

Retubing Condensers.

RIPON GAS DEPARTMENT. Tenders by Jan. 18.

Station Meter.

EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by Jan. 30.

Tar and Liquor.

GAINSBOROUGH GAS DEPARTMENT. Tenders by Dec. 29.
HARROGATE GAS COMPANY.

Washer & Liquor Cooler & Washer-Scrubbers.

EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by Jan. 30.

OXIDE OF IRON.

O'NEILL'S OXIDE has a larger annual sale than all other Oxides combined.

SPENT OXIDE purchased in any district.

GAS PURIFICATION & CHEMICAL CO., LD.

JOHN WM. O'NEILL, Managing Director,

PALMERSTON HOUSE, LONDON, E.C.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

GAS TAR wanted.

BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 254 Oldham, and 2412 HOP, London.
Telegrams:—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

DUTCH OXIDE OF IRON.

THE First Dutch Bog Ore Co., Ltd., (Eerste Hollandsche Yzererts Maaty), ROTTERDAM.

General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON; and at Tower Chambers, Brown Street, MANCHESTER.

London Managers—
E. PADFIELD & CO., 96-98, Leadenhall Street, LONDON, E.C.

General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

OXIDE OF IRON.
(NATURAL.)

BALE & CHURCH will be pleased to send Samples and Quotations, and make Offers for SPENT OXIDE.

BALE'S FIRE CEMENT, PAINT, AND GAS COAL.

5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manu-facture of SULPHATE OF AMMONIA.

SPENCER, CHAPMAN, AND MESSEL, LIMITED, 86, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 841 AVENUE.

BROTHERTON & CO., LIMITED.

Offices: Commercial Buildings, LEEDS. Correspondence invited.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

CHRISTMAS HOLIDAYS.

In consequence of the CHRISTMAS HOLIDAYS, Communications for the next issue of the "JOURNAL" and Orders respecting ADVERTISEMENTS should be received at the Office NOT LATER than FRIDAY AFTERNOON.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.
Payable in Advance. If credit is taken, the charge is 25s. a year.
Abroad (in the Postal Union): £1 7s. 6d., payable in Advance.

All Communications, Remittances, &c., to be addressed to
WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSE MOUNT IRON-WORKS, ELLAND.

THE KEITH LIGHT.

OVER 1600 INSTALLATIONS IN DAILY USE.

SEE illustrated advertisement in next week's issue.
JAMES KEITH AND BLACKMAN, Co, LTD., 27, Farringdon Avenue, LONDON, E.C.

"NUGEPE" CEMENT.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

GASHOLDER PAINTING.

PAINTING Work for all kinds of Gas- Works Plant undertaken by contract or otherwise.
FREDERICK BOYALL, 31, Regent's Row, Queen's Road, DALSTON, N.E. Established 1850.

GLASS SHADES of every description, for all kinds of Interior **GAS LIGHTING.** Illustrated sheets on application.
JOHN WALSH WALSH,
SOHO AND VESTA GLASS WORKS, BIRMINGHAM.
Telegrams: "VESTA, BIRMINGHAM."
National Telephone: No. 63.
London Show-Room: 4, HOLBORN CIRCUS, E.C.

COAL GAS TAR wanted.
BEST PRICES GIVEN.
SHARPNESS CHEMICAL COMPANY, LIMITED, Sharpness Docks, GLOS.

PATENTS AND TRADE MARKS PUBLICATIONS. "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Repairs.
See our exhibit at the International Gas Exhibition, Earl's Court, Nov. 19 to Dec. 17.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.
Telegrams: SATURATORS, BOLTON. Telephone 0848.

AMMONIACAL LIQUOR wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers, Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

SPENT OXIDE.

THE South Metropolitan Gas Company are always open to receive OFFERS of SPENT OXIDE.
Chief Office: 709, Old Kent Road, London, S.E.
Telegrams: "METROGAS, LONDON."

THE HANWELL PATENT RISING & FALLING GAS PENDANT (described in the JOURNAL for Nov. 22, p. 599).
Write for full Particulars to THE HANWELL PENDANT COMPANY, Abington Street, NORTHAMPTON.

AMMONIACAL Liquor wanted by JOHN RILEY & SONS, Hapton, near ACCRINGTON.

TRAVELLER (Junior), Smart Young Man, required for Provinces.
Apply, by letter, stating Age, Experience, Salary, &c., to JOHN WRIGHT & Co., 19/21, Queen Victoria Street, LONDON, E.C.

A FIRM of Gas Engineers require a Traveller with good connection and knowledge of Gas-Works Plant requirements and General Constructional Engineering Trade. Must be energetic.
Apply, by letter, stating full Particulars of previous Experience, with Terms required, to No. 4308, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS AND ELECTRIC LIGHTING TRADES.

WANTED by a large Firm of Manu- facturers, an exclusive REPRESENTATIVE for London and District. Highest References, and Good Connection essential.
Apply, by letter, to No. 4311, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a young Man to undertake the erection of small Gas-Works. Must be able to supervise all work, fix Gas Pipes and Fittings, adjust all types of Burners, and test plants erected. Bachelor preferred.
Apply, by letter, stating Age, Salary expected, and previous Experience, to No. 4312, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Hong Kong and China Gas Com- pany, Limited, require the services of a Young Man to MANAGE one of the Stations. He must be qualified to Take Charge of the Manufacture and Distribution of the gas, and be conversant with the most advantageous way of Lighting and other uses to which gas is applied. Salary to commence at £250 per annum, with free Residence and Light.
Applications, with *copies* of Testimonials, to be sent to the SECRETARY, 148, Gresham House, OLD BROAD STREET, E.C.

WANTED, a firm of Good Repute to undertake the MANUFACTURE and SALE of New Patented Apparatus for making Gas. Good profits yielded. The English Patents will eventually BE SOLD to a firm having suitable machinery for the manufacture of the apparatus.
Address No. 4265, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

BENZOL COLUMN—Required to hire for about Two Months, Column suitable for Aders Benzol Still (present Columns being repaired).
State Terms to Messrs. BROOKE, SIMPSON, AND SPILLER, LIMITED, Atlas Works, Hackney Wick, LONDON, N.E.

COKE FOR SALE—100-150 Tons of best GAS COKE free on rail Pinner, Metropolitan Station.
Send highest Price to the MANAGER, Gas-Works, PINNER.

NEW Gasholder, 40 ft. diameter by 12 ft. deep, with Steel Standards; also new STEEL TANK to contain same.
Write J. WRIGHT, 181, Queen Victoria Street, LONDON, E.C.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

BUXTON URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply of RETORTS and FIRE-CLAY GOODS.
Particulars of same, and Form of Tender, may be obtained on application to the Gas Manager, Mr. H. Barker, Gas-Works, Buxton.
Tenders, sealed and endorsed "Retorts," to be forwarded to the undersigned not later than Saturday, the 31st inst.
The Committee do not bind themselves to accept the lowest or any Tender.

JOSIAH TAYLOR,
Clerk to the Council.

GAS and Water Works Supplies and Construction Company, Limited, are open to purchase small or large Gas-Works. Constructors for all Gas and Water Work and Main Laying. All Gas and Water Works Plant and Fittings supplied. Gas and Water Works Financed. Shares and Stock accepted in part payment for Work and Materials supplied. Gas and Water Works Shares and Stock Underwritten and Issued.
LONDON OFFICE, 99, CANNON STREET, E.C.

TENDERS FOR GAS COAL.

THE Lighting Department of Copen- hagen is prepared to receive TENDERS for the supply and delivery of 150,000 Tons of best GAS COAL from the beginning of March until the end of December, 1905.
The Lighting Department reserves the right to divide the Contracts between two or more Contractors.
Further Information and Conditions for the delivery may be obtained on application to Direktoren for Kjobenhavns Belysningsvæsen, Vester Boulevard 22, Copenhagen B.
The Tenders, sealed and marked "Tilbud paa Kul," to be sent to Direktoren for Kjobenhavns Belysningsvæsen, Vester Boulevard 22, Copenhagen B, before the 16th of January, 1905, Twelve o'clock, at which time the Tenders will be opened in the presence of the Parties tendering who are in attendance.

THE LIGHTING DEPARTMENT OF COPENHAGEN.
Dec. 17, 1904.

TO TAR DISTILLERS.

THE Directors of the Harrogate Gas Company invite TENDERS for their surplus TAR for One Year, from the 1st of January, 1905.
Particulars to be obtained upon application to
H. WILKINSON,
Secretary.
Gas Offices, James Street, Harrogate.

CITY OF RIPON.

THE Corporation invite Tenders for RE-TUBING Four ANNULAR CONDENSERS.
Plans and Specifications prepared by the Gas Manager; and any further Information may be obtained on application to him at the Gas-Works, Ripon, on remitting cheque or Postal Order for 10s. 6d, which will be returned on receipt of a *bonâ-fide* Tender.
Tenders to be sent in to me sealed and marked on the outside "Gas-Works Tender," on or before Wednesday, the 18th day of January next.
The acceptance of the lowest or of any Tender is not guaranteed.

By order,
M. KIRKLEY,
Town Clerk.
Town Hall, Ripon, Dec. 15, 1904.

MANCHESTER CORPORATION GAS-WORKS.

THE Gas Committee invite Tenders for the supply and delivery of the FIRE-CLAY GOODS required during next season at their several Gas-Works.
Full Particulars and Forms of Tender may be obtained from Mr. C. Nickson, Superintendent, at the Gas Offices, Town Hall, Manchester, on payment of a deposit of Two Guineas, which will be returned on receipt of a *bonâ-fide* Tender.
Sealed Tenders, endorsed "Tender for Fire-Clay Goods," addressed to the Chairman of the Gas Committee, Town Hall, Manchester, are to be delivered at the Gas Offices, Town Hall, not later than Ten a.m. on Friday, the 6th of January, 1905.

By order,
WM. HENRY TALBOT,
Town Clerk.
Town Hall, Manchester,
Dec. 16, 1904.

GAINSBOROUGH URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

TENDERS FOR AMMONIACAL LIQUOR.

THE Gas Committee of the above Council are prepared to receive TENDERS for the purchase of the AMMONIACAL LIQUOR produced at their Gas-Works for a period of Twelve Months from Jan. 1, 1905.
Further Particulars may be obtained on application to the undersigned.
Sealed and endorsed Tenders, addressed to the Chairman of the Gas Committee, must be delivered at the Gas-Works, Gainsborough, not later than Thursday, Dec. 29, 1904.
The Committee do not bind themselves to accept the highest or any Tender.

JOHN BALDWIN,
Manager.
Gas-Works, Gainsborough,
Dec. 15, 1904.

EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS.

GAS-WORKS PLANT AND APPLIANCES.

THE Commissioners are prepared to receive TENDERS for the supply of all or any of the following Plant and Appliances delivered and erected at their Granton Works. The whole of the work is to be carried out in conformitywith the General Conditions and Clauses of Commissioners' Specification, and is to be delivered, completed, and put to work, on or before the 31st day of December, 1905.

1.—GAS EXHAUSTERS and ENGINES.
2.—WATER TUBE CONDENSERS for Coal Gas.
3.—GAS WASHER and LIQUOR COOLER.
4.—PELOUZE and AUDOUIN CONDENSER.
5.—WASHER-SCRUBBER of the Rotary Type for Coal Gas.
6.—WASHER-SCRUBBER and Appliances for extraction of Cyanide compounds.
7.—STATION METER.

Specification, Schedule of Quantities, and Form of Tender, may be obtained on application to Mr. W. R. Herring, M.Inst.C.E., Chief Engineer and Manager, New Street Gas-Works, Edinburgh, on receipt of a crossed cheque for Five Guineas, which will be returned when a *bond-fide* Tender is received.

Tenders to be lodged with the undersigned on or before Monday, the 30th day of January, 1905, at Ten a.m., sealed and endorsed as directed under each portion of the Plant.

The Commissioners do not bind themselves to accept the lowest or any Offer.

JAMES McG. JACK,
Clerk.

25, Waterloo Place, Edinburgh,
Dec. 10, 1904.

HORNSEY GAS COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company, relating to DEBENTURE STOCK ONLY, WILL BE CLOSED on the 17th inst., and RE-OPENED on the 1st of January, 1905.

By order of the Board,
WILLIAM E. ROBERTS,
Secretary.

63, Chancery Lane, Dec. 16, 1904.

NEWCASTLE AND GATESHEAD WATER COMPANY.

SALE BY AUCTION OF £54,000 (OR THEREABOUTS) OF SEVEN PER CENT. MAXIMUM ORDINARY STOCK (ACT 1898).

MR. CHARLES A. JOEL will Sell by AUCTION, at the Company's Offices, Pilgrim Street, Newcastle-on-Tyne, on Tuesday, the 17th of January, 1905, at Half-past Twelve o'clock in the Afternoon, £54,000 (or thereabouts) of 7 PER CENT. MAXIMUM ORDINARY STOCK, under the Act of 1898, in Lots of £100.

The above Stock is the balance of the 7 per cent. Maximum Ordinary Stock created under the powers of the Newcastle and Gateshead Water-Works Act, 1898.

The dividend is subject to proportionate diminution whenever the maximum dividend to which each class of Ordinary Stock of the Company is entitled shall not be paid in full; but such diminution may be made up in subsequent years.

Printed Particulars and Conditions of Sale may be had at the Company's Offices, and Messrs. George Armstrong and Sons, Solicitors, Newcastle-on-Tyne; or of the Auctioneer, 27, Northumberland Street, Newcastle-on-Tyne.

GEORGE SMITH,
Secretary and General Manager.

Newcastle-on-Tyne, Dec. 7, 1904.

CITY OF NORWICH WATER-WORKS COMPANY.

INCORPORATED BY THE CITY OF NORWICH WATER-WORKS ACT, 1850.

SALE BY TENDER OF 1000 £10 ORDINARY SHARES.

THE Directors invite Tenders (at not less than the value of £16 5s. per Share) for the purchase of 1000 ORDINARY £10 SHARES in the above-named Company. The Shares will be issued as fully paid, and will constitute a portion of the Additional Capital authorized to be raised under the powers and provisions contained in the City of Norwich Water-Works Act, 1898.

These Shares rank for a Maximum Dividend of 6 per cent. per annum, and the Dividends on similar Shares have for the last 13 Years been paid at the rate of 6 per cent. per annum.

Payment for the Shares is to be made on or before the 14th of January, 1905.

The Dividends are paid half-yearly, and will accrue from the 14th of January next.

Particulars, with Forms of Tender, may be obtained on application to the Secretary, to whom Tenders, marked "Tenders for Shares," must be delivered on or before the 31st of December next.

By order of the Directors,
G. CHRISTOPHER DAVIES,
Secretary.

11, Prince of Wales Road,
Norwich, Nov. 14, 1904.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

BOOKS AND LEAFLETS

TO BE OBTAINED OF
WALTER KING,
11, BOLT COURT, FLEET STREET, E.C.

CALORIMETRY OF PRODUCER AND ILLUMINATING GASES.—By JOHN F. SIMMANCE, Assoc. M.Inst.C.E., M.Inst.Mech.E. *Price 2s.*

PRACTICAL PHOTOMETRY: A GUIDE TO THE STUDY OF THE MEASUREMENT OF LIGHT.—By W. J. DIBDIN, F.I.C., F.C.S., late Chemist and Superintending Gas Examiner to the London County Council. *Price 7s. 6d.*

CHEMICAL TECHNOLOGY.—ELECTRIC LIGHTING. By A. G. COOKE, M.A., A.M.Inst.C.E. PHOTOMETRY. W. J. DIBDIN, F.I.C., F.C.S. 1 Vol. *Price 2Cs.*

COAL TAR AND AMMONIA.—By GEORGE LUNGE, Ph.D. Third Edition. *Price 42s.*

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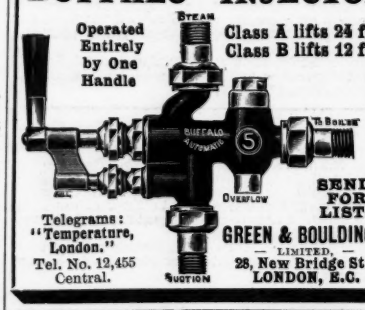

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Manufacturers of Incandescent Mantles.
Importers of all kinds of Fittings & Accessories.

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THOMAS TURTON AND SONS, LIMITED,
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MANUFACTURERS OF
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HEATHCOTE GAS COAL.
Rich in Illuminating Power and yield of Gas. Above the Average in Weight and Quality of Coke. Maintains a High Standard in Residuals.

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CHESTERFIELD.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,
Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

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Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

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THE
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STATION METER.

Efficiency Demonstrated.

APPLY—
T. G. MARSH,
MAWSON CHAMBERS, DEANSGATE, MANCHESTER.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

THE SILICA FIRE-BRICK COMPANY,
OUGHTIBRIDGE, near SHEFFIELD,
MANUFACTURE
SILICA BLOCKS, BRICKS, AND CEMENT
OF SUPERIOR QUALITY
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Trade Mark: "SILICA."

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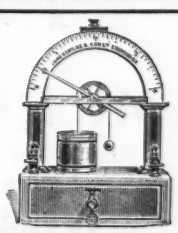

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For Illustrated Advertisement, with full Particulars see "JOURNAL" for Dec. 13, p. 875.

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[See Illustrated Advertisement, Dec. 6, p. 808.]

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are the embodiment of that, and are effective to both Water and Oil Gas and other fogs, and

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USERS.

We agree to supply our P.C. without any direct charge—payment being by results only. Lessens all further cost, labour, and trouble throughout the works and distribution.

See last week's Advertisement, page 871.

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THE Inventions enumerated below are valuable and worthy of the careful attention of all firms who desire to keep pace with the times with their plant. The Patent Rights are either for Sale outright, or may be worked on Licence, or we will on reasonable terms agree to their being manufactured and supplied by a Company to be formed for that object.

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Primary Cleanser.—A most perfect device arranged so as to arrest the greater part of the heavy impurities in crude gas before being conducted through any other device, thereby lessening the task of such apparatus, and consequently giving it a much longer period of action, and securing more thorough purification.

Note.—We are prepared to supply this Primary Cleanser without direct charge, taking payment by results and savings over an agreed period.

Hydraulic Main Valve.—A simple arrangement in one Valve, by which the seals to dip pipes are regulated as to depth, or removed, and also, when required, acts as a complete stop valve. All these manipulations are made with one movement and with but one moving part.

New Four-Way Valve.—This one Valve is capable of performing the following functions: Reverse motion, bye-pass, and complete double-faced stop, all combined and working with but one moving part. This Valve is applicable to the reversing of any single or combination of apparatus.

Centre Valve.—This Valve enables one to have all his four purifiers in work, and at any time to cut out for changing, and immediately to put into action again. It also, with the addition of one of the above four-way valves, enables one to reverse the whole bed of purifiers, thereby ensuring greater duty from the purifying material.

Retorts.—Something new in Retorts and their charging, which will do away with many of the disadvantages of the present inclined and vertical systems, and which will also include many advantages hitherto unheard of. They save capital expenditure, gas, time, and labour. They are equally adaptable to medium and small, as well as to large works.

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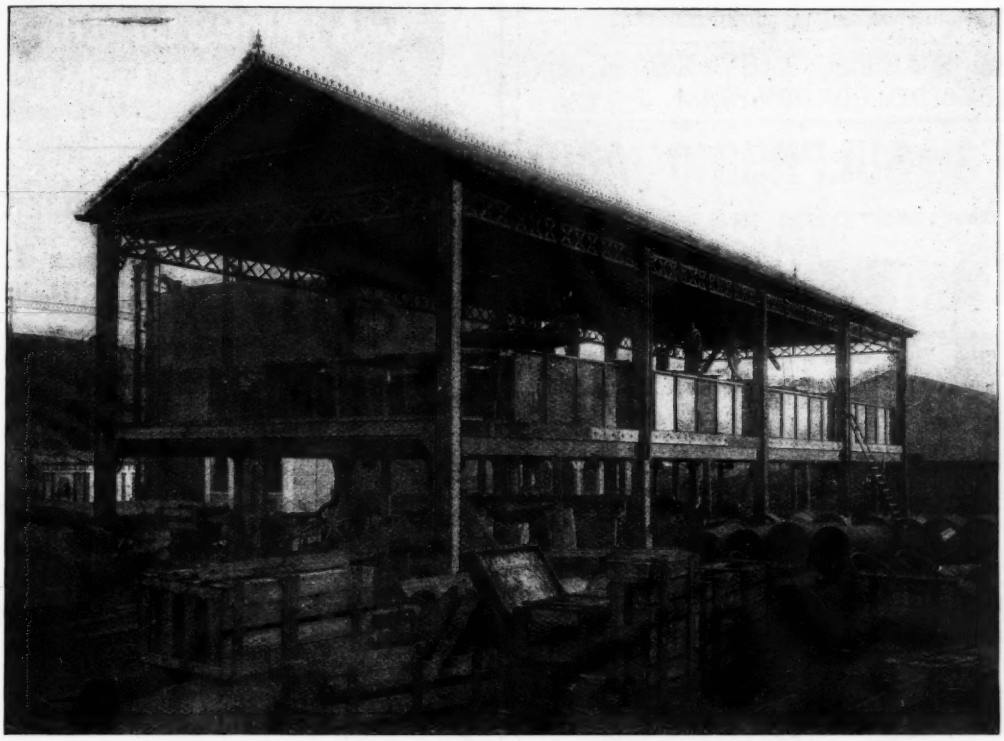

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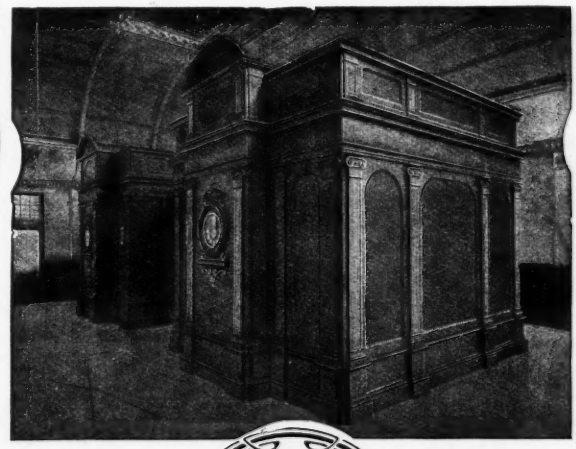
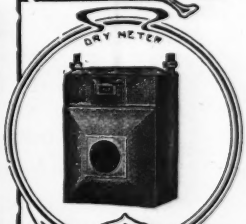
GAS & WATER ENGINEERS,





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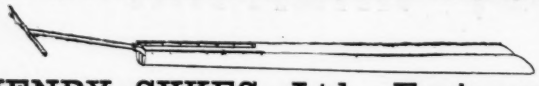

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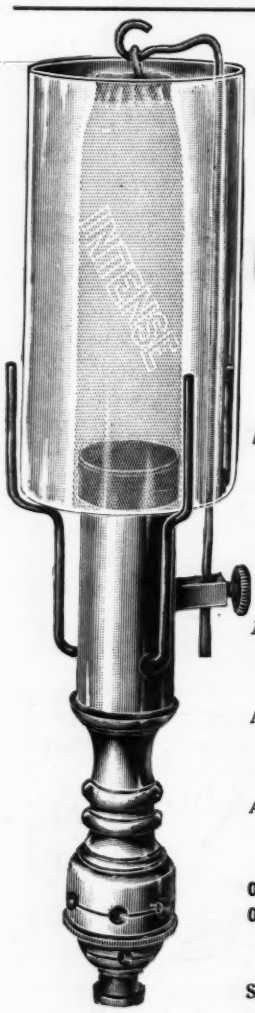

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Cliff's Patent Machine-Made Retorts possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

Retorts carefully Packed for Export.

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An ounce of fact.

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Six months, April—Sept. 1903, electric light	£27	17	11
gas light .	4	7	1
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Same period, 1904, electric light . .	£3	1	9
Lucas light . .	14	11	4
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Saving through Lucas Light, £14 11s. 11d. in Six Months.

As the period in question is the lighter half of the year, it is safe to say that the saving during twelve months would more than pay for the Lucas Lamps. These are the facts which wide-awake gas companies profit by. MOFFAT'S LTD., 155, FARRINGDON ROAD, LONDON, E.C.

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MAINTENANCE SIMPLIFIED.

Nothing to Corrode. Nothing to Choke.

Nothing to get out of Order.

Made in 4 Sizes consuming 3, 4, 4½, and 6½ feet. In Brass or Nickelled.

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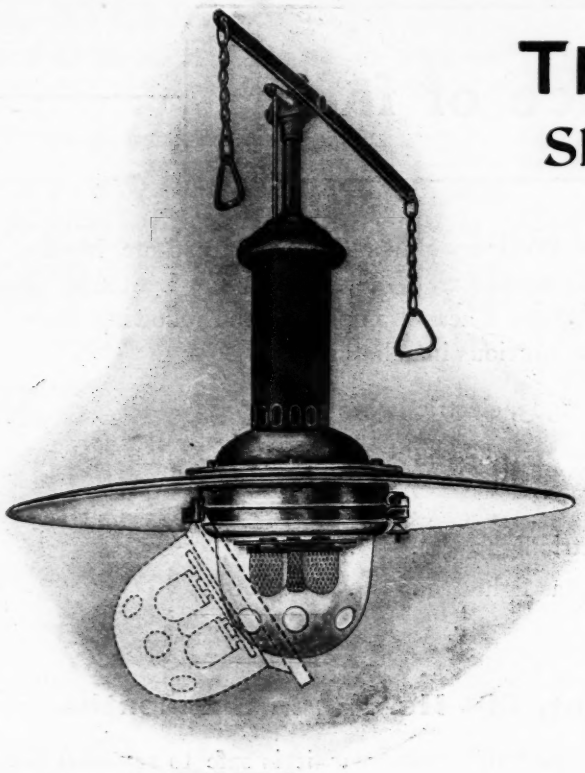

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Shadowless Inverted Cluster Lamp.

PATENTED AND REGISTERED.

A very efficient Lamp for all Buildings where a good downward light is wanted.

The special feature of the "**Drury**" Inverted Cluster Lamp is the way in which a cluster of Three Inverted Mantles is suspended from an interior white enamelled plate. The Three Mantles are arranged so close together that they have the appearance of one large brilliant Incandescent Ball, giving a surprising effect of its lighting power.

The Lamp is provided with a small interior Bye-Pass. Only "**Drury**" Mantles should be used to obtain the best effect, as they have a special Registered Holder which ensures the Mantles keeping a central position.

No. 2203. For Indoor use, 49s. 6d. Complete with Mantles as shown. Extra Mantles, 7s. per dozen.

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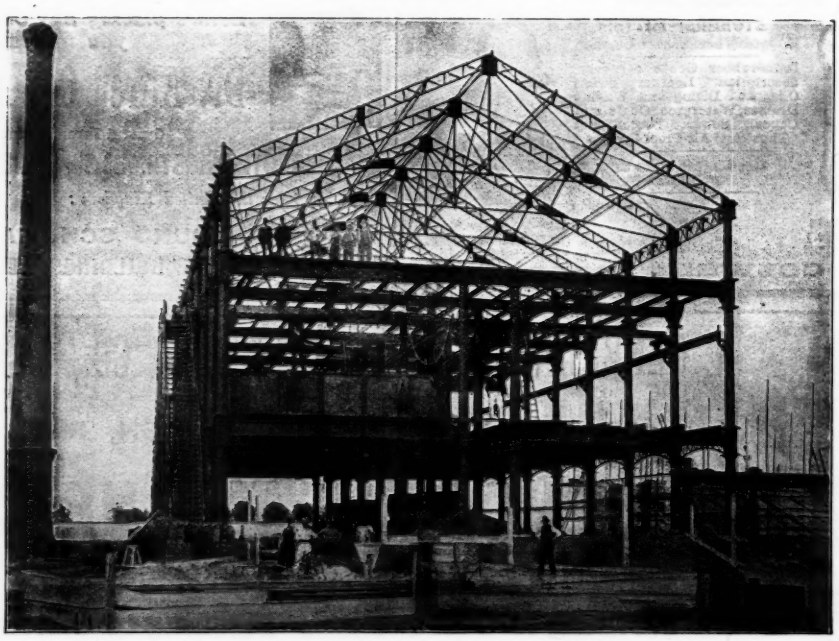

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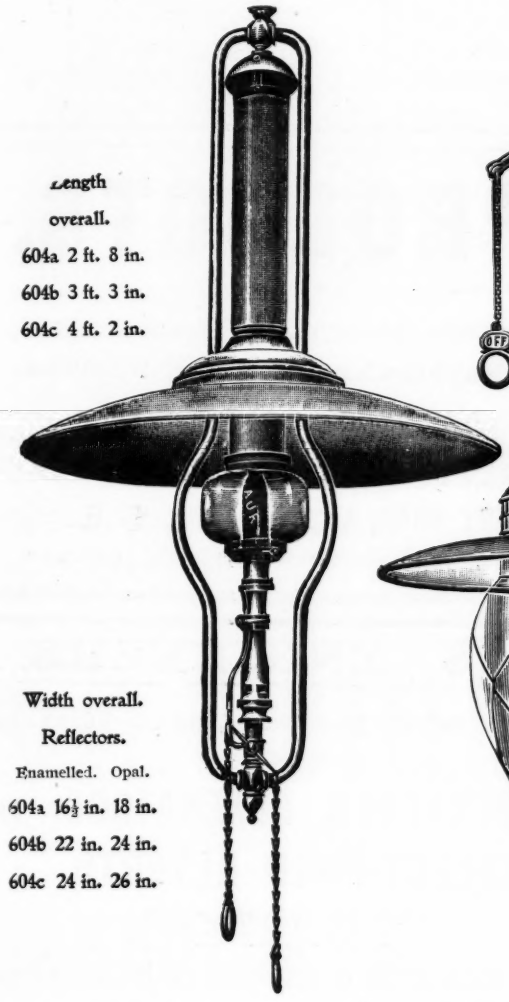
The Welsbach·Kern (Patent)

Self-Intensifying Lamps.

Length overall.
604a 2 ft. 8 in.
604b 3 ft. 3 in.
604c 4 ft. 2 in.



Width overall.
Reflectors.
Enamelled. Opal.
604a 16½ in. 18 in.
604b 22 in. 24 in.
604c 24 in. 26 in.

Fig. 604.

Interior Lighting. Enamelled.
A 5 ft. per hour, 150 c.p., £1 13 0
B 10 ft. „ 300 c.p., 2 8 0
C 20 ft. „ 600 c.p., 4 4 0

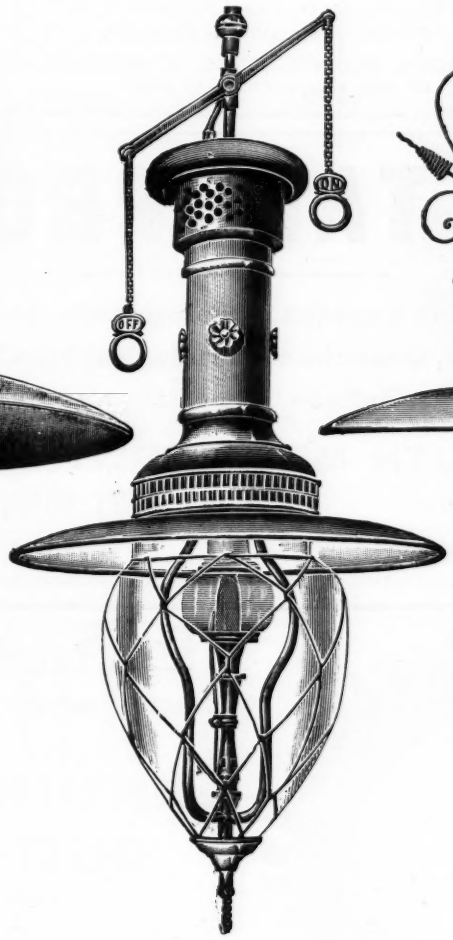
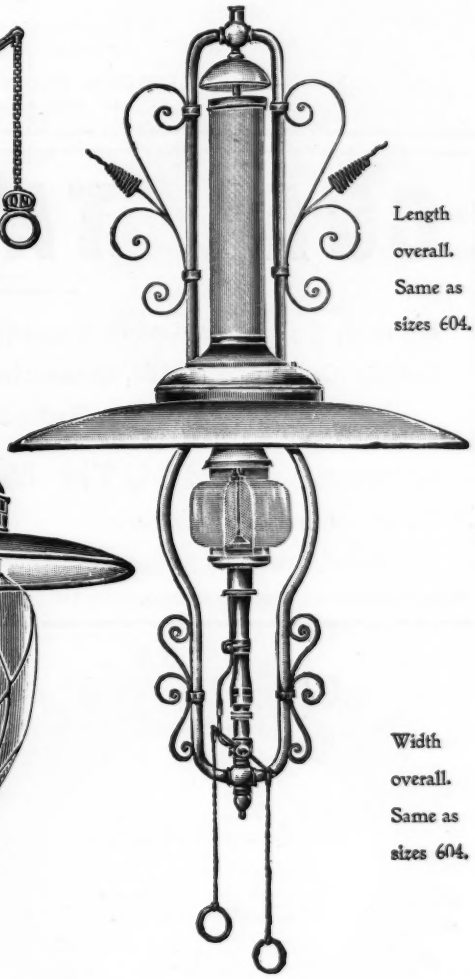


Fig. 607.

Overall.	Length.	Width.
607b	4 ft. 4 in.	24 in.
607c	5 ft. 0 in.	29 in.

Storm Proof Arc. Enamelled Reflector, Cup and Ball Joint, Lever Tap and By-pass.
607b 10 ft. per hour, 300 c.p. £5 0 0
607c 20 ft. „ 600 c.p. 7 10 0



Length overall. Same as sizes 604.

Width overall. Same as sizes 604.

Fig. 605.

Interior Lighting (Ornamental).
605a 5 ft. per hour, 150 c.p., £2 5 0
605b 10 ft. „ 300 c.p., 3 1 6
605c 20 ft. „ 600 c.p., 5 0 0

SUBJECT TO OUR USUAL TRADE DISCOUNT.

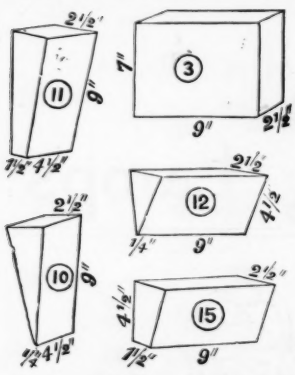
The Welsbach Incandescent Gas Light Co., Ltd.

2 to 14, Palmer Street, Westminster, London, S.W.

Telegrams—"Welsbach," London. Telephone—290 West.

STEPHENS & CO., KIDWELLY.

Contractors to a large number of the Principal Gas-Works.



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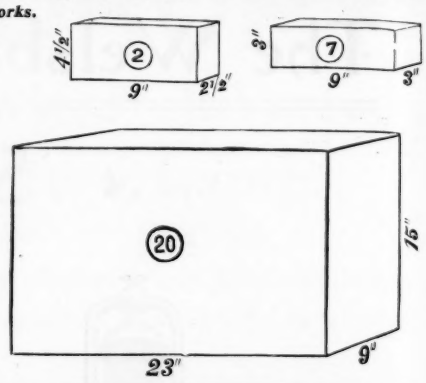
SILICA BRICKS, BLOCKS, SHIELDS, TILES.

SPECIAL PLASTIC SILICA CEMENT.

Without doubt the finest Materials in the Market for Gas-Works Furnaces.

BRICKS, BLOCKS, TILES, & SHIELDS of any shape made to order.



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GAS ENGINEERS.

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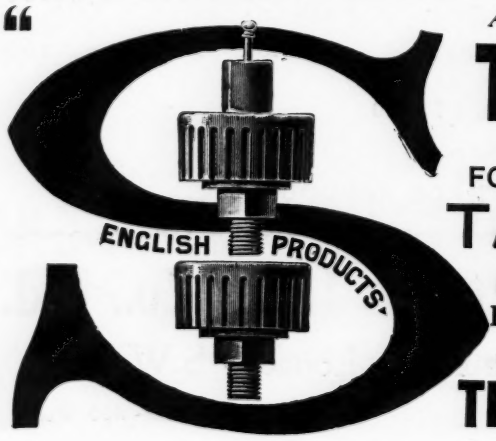

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CENTIGRADE FOR HOT PLACES **LUBRICANT"**

TANDARD MACHINE GREASE.

AVING UP TO 90 PER CENT. OVER LIQUID OIL.

Patent "Unbreakable" & "Telltale" Stauffer Lubricators.

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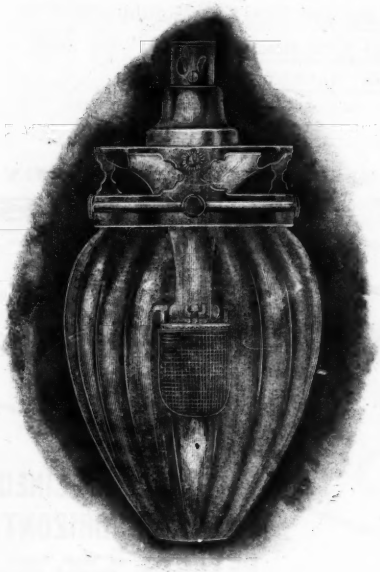
INCREASED DISCOUNTS TO THE TRADE.

New types of BURNERS at popular Prices.

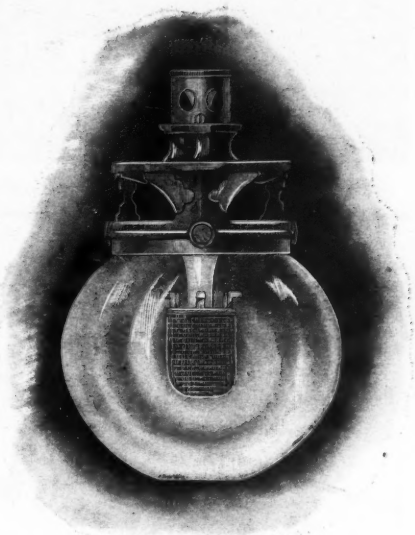


No. 2 Burner only, in Polished Brass or Steel Bronze, 4s. 6d.
Globes from 6d. each. Mantles 7s. per dozen.

MAXIMUM LIGHT WITH MINIMUM CONSUMPTION OF GAS.

The "Bijou" Burner in clusters for interior lighting has the decorative effect of Electric light at One-Eighth the cost.

NEW LISTS NOW READY.



No. 3 Bijou" Burner only, in Polished Brass or Steel Bronze, 3s.
Globes from 4d. each. Mantles 6s. 6d. per dozen.

ONLY ADDRESS: **THE NEW INVERTED INCANDESCENT GAS LAMP CO., LD.,**
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PURIFIER GRIDS
CAPACITY OF PURIFIERS DOUBLED.
PRESSURE CONSIDERABLY REDUCED.

CARBURETTED WATER GAS
Maximum Efficiency Guaranteed.
A LARGE NUMBER OF PLANTS IN OPERATION

Every Requirement for Gas-Works.

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DEEP, SEMI-DEEP, AND SHALLOW.

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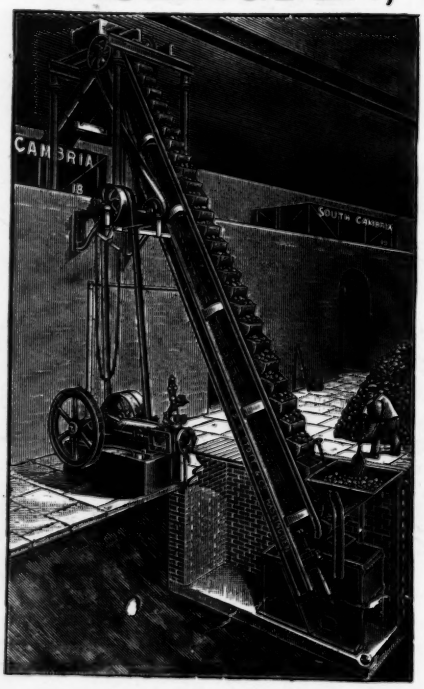

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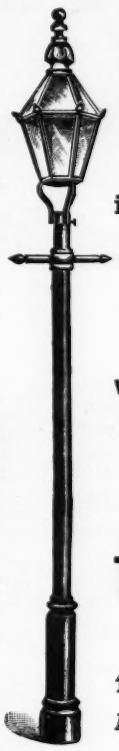

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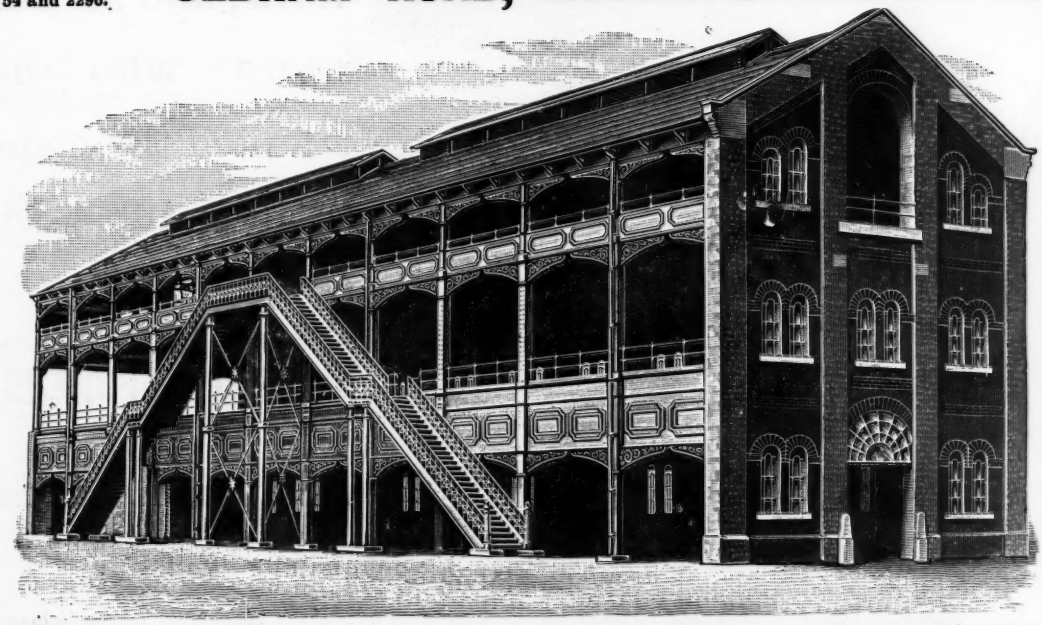

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[See also Advt. on p. 892.

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